Welding Engineer

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OCTOBER, 1957

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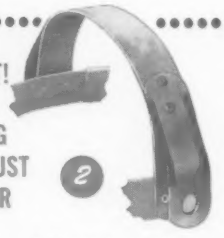
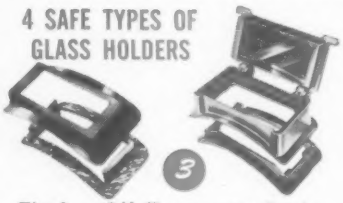


2

One size fits all head sizes! Free-floating principle . . . avoids pressure at temples and forehead. Allows comfortable shaping of headband to head! Special riveting prevents hair pulling.

4 SAFE TYPES OF GLASS HOLDERS



3

Fixed or Lift-Front, ruggedly designed and fabricated in Bakelite or Insulated Dowmetal. Light, durable. Metal holders are safe, insulated. Glasses easily inserted or removed.

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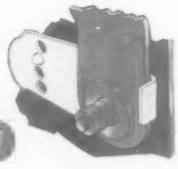
4

Revolutionary, light, durable material with entire mechanism enclosed in fibre tube insulating it from head of wearer. Right or left turning to adjust size . . . remains positive.

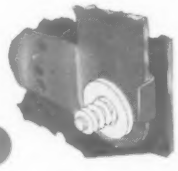
4-POSITION ADJUSTABLE HELMET STOP



5

Positions helmet for overhead and vertical welding. Positive stop, easily adjustable to any of 4 positions without tools. Allows normal raising of helmet on friction joints.

LONG-LASTING FRICTION JOINTS



6

A variety of designs for all purposes, allowing easy, outside adjustment with no plastic parts to break. A slight nod brings Helmet to operating position.

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7

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Uses small diameter wire instead of bulky high cost water cooled cable. Saves time and labor on hard-to-get-to places.

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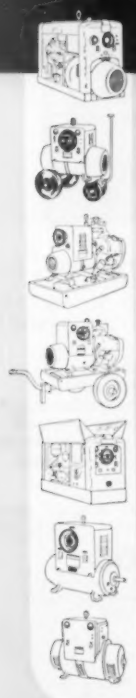
Continuously records temperature of preheating and stress relieving so that you know what the temperature is at any time.

A toggle switch on the control panel makes it easy to demagnetize the pipe before welding.

This unit can be set for a complete program of preheating and stress relieving with controlled heating rate, soaking time and controlled cooling rate.



If your operations require the reduction of thermal stresses, the removal of hard zones, and reduction or lowering of Brinell hardness in the welding of high pressure pipe—preparing vessels for welding such as heat exchangers, boilers, vats or wherever controlled heat is required in preparation for welding, this new 400 cycle generator with its fully automatic controls has completely revolutionized the process. You should not operate another day without complete information in your files. Write us for details . . . or see this unit in operation at the NATIONAL METAL SHOW, BOOTH NO. 1251—EXHIBITION HALL—INTERNATIONAL AMPHITHEATER —Chicago, November 4 thru 8.

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Welding Engineer

OCTOBER, 1957
VOL. 42—No. 10

THE MAGAZINE OF JOINING
AND SEVERING OF MATERIALS

America's Pioneer publication which, combined with The Acetylene Journal, has been devoted to the interest of the welding and allied industries since 1898

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P.O. Box 28
Morton Grove, Ill.
Telephones:
ORchard 4-5130, IRving 8-3355

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Single copies 50 cents. Subscription rates: United States and possessions $3 per year; $4 for two years; $5 for three years. Canada $5 per year; $8 for two years; $10 for three years. All other countries $15 per year; $25 for two years; $30 for three years. Position and company affiliation must be indicated on subscription form. Allow one month for change of address.

Published monthly, with an additional directory number in June, by Welding Engineer Publications, Inc.

Entered as second class matter Aug. 23, 1948, at the Post Office at Chicago, Ill., under Act of March 3, 1879. Printed in U. S. A.

WELDING ENGINEER is indexed regularly by Engineering Index, Inc.

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2nd World Metal Congress in Chicago's Amphitheatre 68
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37 VICTOR for hardfacing

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THE first of 24 welded aluminum railroad gondola cars, ordered by Kaiser Aluminum & Chemical Corp. from Pullman-Standard Car Mfg. Co., stands behind officials of the firms. From left to right they are: Pullman's W. S. Boese, chief welding engineer and R. M. Shaver, freight division engineering manager; Kaiser's C. O. Curell, R. G. Beeson and A. H. Ringholm.

WELDING engineers from nearly every continent watch a demonstration of semiautomatic submerged-arc welding at the Lincoln Electric plant in Cleveland, Ohio. They recently spent four weeks with Lincoln engineers studying new welding techniques and equipment and discussing world-wide welding problems.

News

Hobart "fishes" for rutile

With a "constant flow" mineral separator, Hobart Brothers Co. separates titanium dioxide from sand at the firm's Winter Beach, Fla., mining site.

The mine-it-yourself operation was brought about by the scarcity and high cost of rutile, one of the three forms of titanium dioxide, which is used as a weld purifier. It is washed out of wave-pounded rock along the coast of South Carolina and Georgia, carried south by the current and deposited along Florida's coastline.

Ore is converted into usable titanium dioxide, illmenite, zircon and monozite with Hobart's two-unit, continuous-cycle operation.

Special sandwich: brazed honeycomb

Lightweight panels of all-metal honeycomb "sandwiches" for America's first supersonic bomber, the delta-winged B-58 "Hustler," will be manufactured by Solar Aircraft Co. The high-temperature sandwich structures are being used on critical sections of the aircraft instead of conventional welded construction because honeycomb offers a strength-to-weight ratio not given by unstructured materials.

The honeycomb structural material combines lightness, strength and heat resistance. To produce the sandwich structures, Solar uses a special high-temperature brazing process. The aircraft firm designed its own core-making machinery.

Rapid rise for Bronx welding firm

Last May 15 a new firm, Combined Welder and Machine Corp., opened shop in a 2,500 sq ft building in the Bronx. Now, just six months later, the firm is moving to enlarged—10,000 sq ft—quarters at 73-40 Grand Ave. in Maspeth, L. I.

Ohio State gets welding fellowship

To encourage graduate research and study in welding engineering, a new Air Reduction Fellowship at Ohio State allows $2,400 a year for an unmarried student ($3,000 yearly if married). Air Reduction Co., New York, made the grant through the University Development Fund.

Persons interested in applying for the new fellowship should write to Prof. Roy B. McCauley, chairman, department of welding engineering, Industrial Engineering Building, Ohio State University, Columbus 10, Ohio —at the same time sending a transcript of college credits to the Advanced Admissions Office, Administration Building.

October brings Safety Congress

"Safety first" will definitely be the word at the annual convention of the National Safety Council in Chicago, Oct. 21 to 25. Each year 12,000 safety men get together for the 300 sessions on accident prevention plus general interest talks sponsored by the American Society of Safety Engineers. Safety Congress exhibits—200 in all —will fill the Conrad Hilton hotel exhibit space. They include products, equipment and services related to promotion of safety, health, first aid, sanitation and general welfare.

Some of the safety topics to be covered are: *Engineered Industrial Ventilation* by Kenneth M. Morse, chief industrial hygiene engineer, U.S. Steel Corp., Pittsburgh; *Nuclear Power Pressure Vessels,* Clair E. Keene, vice president of Mutual Boiler and Machinery Insurance Co., Waltham, Mass.; *New Areas of Industrial Safety — Ultrasonic Testing — Noise Reduction,* Fred G. Yelton, director of safety, Delco-Remy Div., General Motors Corp., Anderson, Ind.; *Safety in the Uses of Cylinder Gases in Oxy-Fuel Gas Welding and Cutting,* F. C. Saacks, safety director, Air Reduction Co., Inc., New York City; *The Prescription Safety Goggle Problem,* Dr. E. J. Schowalter, medical director, Western Electric Co., Chicago.

Tweco opens western office

Fifty miles south of San Francisco, in the new Campbell Industrial Park, Tweco Products, Inc., has opened its West Coast division office and warehouse. The office will serve Tweco distributors and dealers west of the Rocky Mountains.

DONALD Sarrat, Charles Stillwell and Robert May watch the first fill of a new Linde oxygen unit. *(See story below.)*

WELDOR trainee John McHatton uses portable flame-cutting equipment specially adapted for cutting and beveling pipe in the field. He is enrolled in the Everett, Mass., Esso Standard Oil Co.'s year-old mechanical training program.

Gulf Welding gets liquid oxygen unit

To serve offshore and land oil drilling rigs in southern Louisiana, Gulf Welding Equipment Co. has installed a Linde 150,000-cu-ft liquid oxygen storage and filling facility. Gulf Welding is filling its new Linde "LC-3" liquid oxygen cylinders from the unit.

"Offshore rigs have storage and handling problems. The new liquid oxygen cylinders will minimize these problems, since the contents of one "LC-3" is equivalent to 11 conventional cylinders," says Charles O. Stillwell, president of Gulf Welding. Land rigs will also benefit from the cylinders, he notes, since many of them are in remote locations.

Atom week is Oct. 28-Nov. 1

International Atom week will be celebrated in New York City October 28 through November 1. Activities include a 1957 Trade Fair of the Atomic Industry at the New York Coliseum, and an atomic industry conference at the Plaza and Waldorf-Astoria hotels.

Ampco will build Texas foundry

A $200,000 branch foundry to produce aluminum bronzes and products of this alloy will be built at Garland, Texas, by Ampco Metal, Inc., Milwaukee. The 15,000 sq ft plant, expected to be in operation by March, 1958, will include sand and centrifugal foundries, heat treating facilities and some machining operations. It also will become Ampco's principal sales and services office in the Southwest. Manufacturing facilities will allow production of bronze castings weighing up to 1,000 lb each.

Federal Machine controls Berkeley-Davis firm

Federal Machine and Welder Co., Warren, Ohio, has acquired a controlling interest in Berkeley-Davis, Inc., Danville, Ill., manufacturers specializing in automatic arc welding equipment.

The Danville firm has been owned and operated by John P. Berkeley and Charles Davis. They will continue to operate the company, and will keep a substantial ownership. Sales and distribution outlets of Federal Machine and Welder Co. will be used to distribute the Berkeley-Davis equipment.

Air Filter adds Milwaukee plant

Air Filter Co. will double its plant capacity with a new plant and offices in Milwaukee, Wis. The firm manufactures a line of filters, including a special filter to protect welding machines from dust and dirt. Special truck loading platforms have been designed for the new building, and murals will decorate walls of the air-conditioned office.

Swiss welding expert to attend metal show

The editor of the Swiss *Welding Journal* will take part in the November World Metallurgical Congress in Chicago. He is Dr. Charles G. Keel, who, besides heading the welding publication, manages to direct the Swiss Welding Association and be professor of welding at the Swiss Federal Institute of Technology, Zurich.

He is a member of the International Institute of Welding and has served as vice-president and president of Commission No. 1, oxyacetylene welding and allied processes. Dr. Keel has written one book on welding, and co-authored the *Oxy-Acetylene Welder*. He has written more than 30 technical papers.

Dr. Keel is the son of Prof. C. F. Keel, a famous Swiss welding pioneer.

New firm enters ultrasonic field

A new company was to have entered the ultrasonic industry in mid-September, reports Paul Martin Platzman, a New York industrialist who is leading the venture. Initial capital will be about a quarter-million dollars.

The firm, which will headquarter in Mineola, L. I., N. Y., will offer ultrasonic cleaning machines and metal working equipment to a nation-wide market.

"Now that ultrasonics has come of age," says Platzman, "industry, which can absorb at least 25 million dollars per annum of this type of equipment, is anxiously waiting for a customer-

(Continued on page 102)

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INERT GAS WELDING CONTROL UNIT
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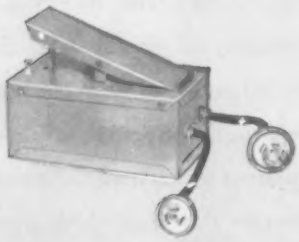
Many designs available for special applications.



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Converts standard welder to constant potential power source for semi-automatic or automatic welding heads and guns.

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Letters should be addressed to: The Editor, WELDING ENGINEER, P. O. Box 28, Morton Grove, Ill. No letter will be published unless signed, but your name will be withheld if requested.

The people act

Dear Sir: *Teaneck, N.J.*

Congratulations on your editorial in the July issue of WELDING ENGINEER. It is one of the best I have seen and certainly your best.

I would like to see a copy of this mailed to every Senator in Congress; but that may be too big a job for me. However, I am anxious that a few of them get it.

Would it be possible for you to make reprints and send me about 20 copies? Also, please send a copy to each of the two Senators in New Jersey, New York and Pennsylvania. I have no idea what this will cost, but enclosed is a check. If this is not enough, please bill me for the balance.

If you send your editorial to the Senators, please tell them it is sent and paid for by a citizen, a voter and a taxpayer. Give them my full name and address.

Ira B. Yates

—Reprints were made and have been sent to all members of the Senate.

Good old days

Dear Sir: *Rockford, Ill.*

I am one of the boys that started in a blacksmith shop at the turn of the century. With the advent of the electric arc we learned to weld with 1/8 in. bare wire, and many times when electrodes were not at hand we used No. 9 fence wire or bailing wire for repair jobs. And they made strong welds, too.

I go along 100% with the California Weldor in your July *Letters to the Editor* column. Pay a code man what he is worth—but the man that gets above scale from me is the weldor who came up in a job shop. More power to Mr. California—the welding industry needs more men like him.

Old Timer

P.S. As you know, I have long been a reader of WELDING ENGINEER.

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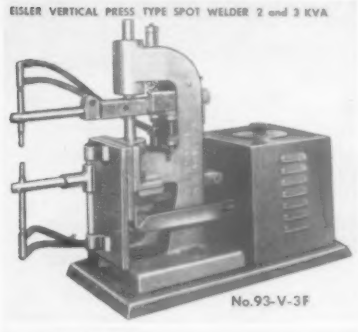

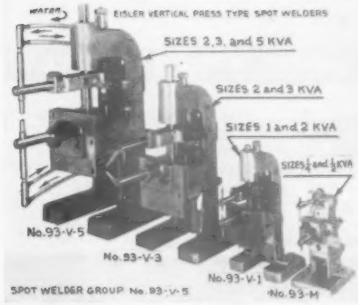

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ENGINEERING CO., INC.
Charles Eisler Jr., President
749 So. 13th St., Newark 3, N. J.

30 YEARS AGO

(Taken from *The Welding Engineer* of October, 1927)

"You can't see through a glass eye," is the title of an editorial urging men to wear goggles to protect their sight. Harry Guilbert, director of safety for the Pullman Co., in a speech to the National Safety Council and the National Committee for the Prevention of Blindness, declared that since 1916, in Pennsylvania alone, 6,842 eyes have been destroyed in industrial accidents.

—30 YEARS AGO—

An arc-welded, rivetless bridge—the first of its kind to be built—is to be erected on the Boston & Maine Railroad at Chicopee Falls, Mass.

—30 YEARS AGO—

Both arc and acetylene welding have become very popular in the oil fields; welding is increasing in favor in the laying of pipe lines.

—30 YEARS AGO—

"Structural welding grows rapidly," is the title of an article which explains that "following scientific and practical demonstrations of the advantages of welded joints, structural engineers find many applications."

—30 YEARS AGO—

Welded steel frames for residences has passed from the visionary stage at least to the experimental stage, for several such residences have already been built.

—30 YEARS AGO—

"Over 50% of all our welding applicants are rejected," says David Wilkerson, foreman of Consolidated Aircraft Corp., Buffalo. "They all seem to be good general weldors but we demand more of a man than mere perfection in welding. He must have qualities that fit in with the high class work required in airplane construction."

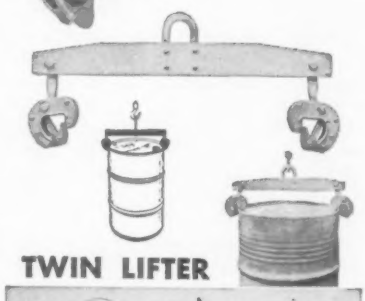
—30 YEARS AGO—

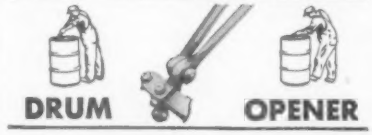
When Pacific Steel Boiler Corp. needed a new heavy-duty (1,000-ton capacity) hydraulic press, they abandoned old ideas of using cast C-frames and built a welded steel frame of entirely new and unique construction. The new welded frame showed a 66% saving in cost.

—30 YEARS AGO—

The atomic hydrogen arc welder is now ready! exclaims a General Electric ad.

YOUR BEST MOVE... MOVE *with* **MERRILL**
MATERIAL HANDLING DEVICES





For Interesting Information write

MERRILL BROTHERS
56-81 Arnold Ave., Maspeth, N. Y.
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NEW TOOL FOR THE TRADE...

■ Here is a handy, 24-page guide that will help you pick the right electrode for *any* job! Electrodes are identified by type, AWS grade and color coding, chemical and physical analyses and suggested uses to aid the welding engineer, purchaser, and designer. The M&T Electrode Selector has been called the "handiest practical guide to electrode selection made available in years" . . . And it's yours *free!* *Write Metal & Thermit today for a copy.*

Metal & Thermit MUREX(R) electrodes for mild, low, alloy and stainless steels, aluminum bronze, cast iron, and aluminum: SPEEDEX iron powder electrodes; and HARDEX hard surfacing electrodes are available throughout the U. S.

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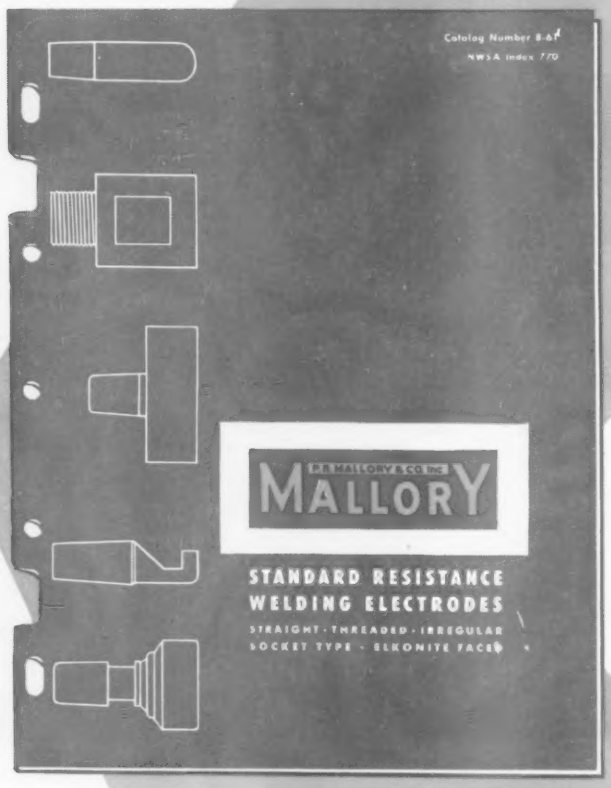
Let Mallory Be Your Guide to

Reduced Welding Costs



* *Get your copy of this brand new Mallory catalog of Standard Resistance Welding Electrodes from your Mallory Distributor.*

Whenever your production plans call for resistance welding, take your pick from Mallory's broad range of *standard* electrodes—listed in this new Mallory catalog. Choosing from this extensive array of standard, in-stock sizes, shapes and types, can materially reduce your production costs by eliminating the need to purchase specially designed, custom made electrodes and fixtures.

Mallory's broad line of resistance welding electrodes are available in a choice of alloys having physical and mechanical properties exactly suited to welding virtually any combination of metals.

When planning your next production operation, you'll find it pays to check the Mallory line, first. Mallory distributors carry most of these standard shapes in stock for your convenience. Should you have special requirements, beyond even this broad line, Mallory's engineering staff will gladly assist in designing or adapting electrodes and assemblies to your specifications.

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For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio

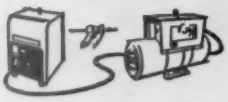
OCTOBER
1957

Your

Weld World

at press time

Last minute news of interest to those engaged in joining and severing materials.



. . Unification of sales efforts by manufacturers of arc and gas-welding equipment may be top industry news sometime in 1958. Two such firms—among the leaders in their fields—are already employing modified form of "combined approach" by successfully sharing manufacturing facilities. Welding Engineer views similar cooperation as an economical "must" for other large producers.

. . Another arc-welding accessory firm has entered the cable market. Lenco, Inc., Jackson, Mo., has added both aluminum and copper welding cable to its line. Insulation will be a bright yellow, to match handle on its electrode holders.

. . Watch for a large aluminum producer to enter the retail market for aluminum welding wire. It has been selling drawn wire to other firms which market it under their own names, but now the prime producer may enter the field with its own brand.

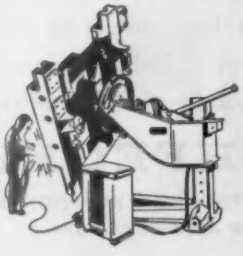
. . Plant expansion is highlighting 1957 for Victor Equipment Co., San Francisco, Calif., which has begun construction of a new two-story, 12,000-sq-ft building. Addition will increase Victor's manufacturing facilities.

. . Site of the 1959 welding show has been switched. Chicago will be host, instead of Buffalo. It's Los Angeles in 1960.

. . Phelps Dodge Corp. and Kennecott Copper Co. have once again cut copper prices in an effort to pep up demand for the key industrial metal. Anaconda, third member of the U. S. copper triumvirate, is expected to duplicate the 1½-cent-per-pound reduction. Copper now stands at 27 cents per pound, down 19 cents from its mid-1956 high of 46 cents.

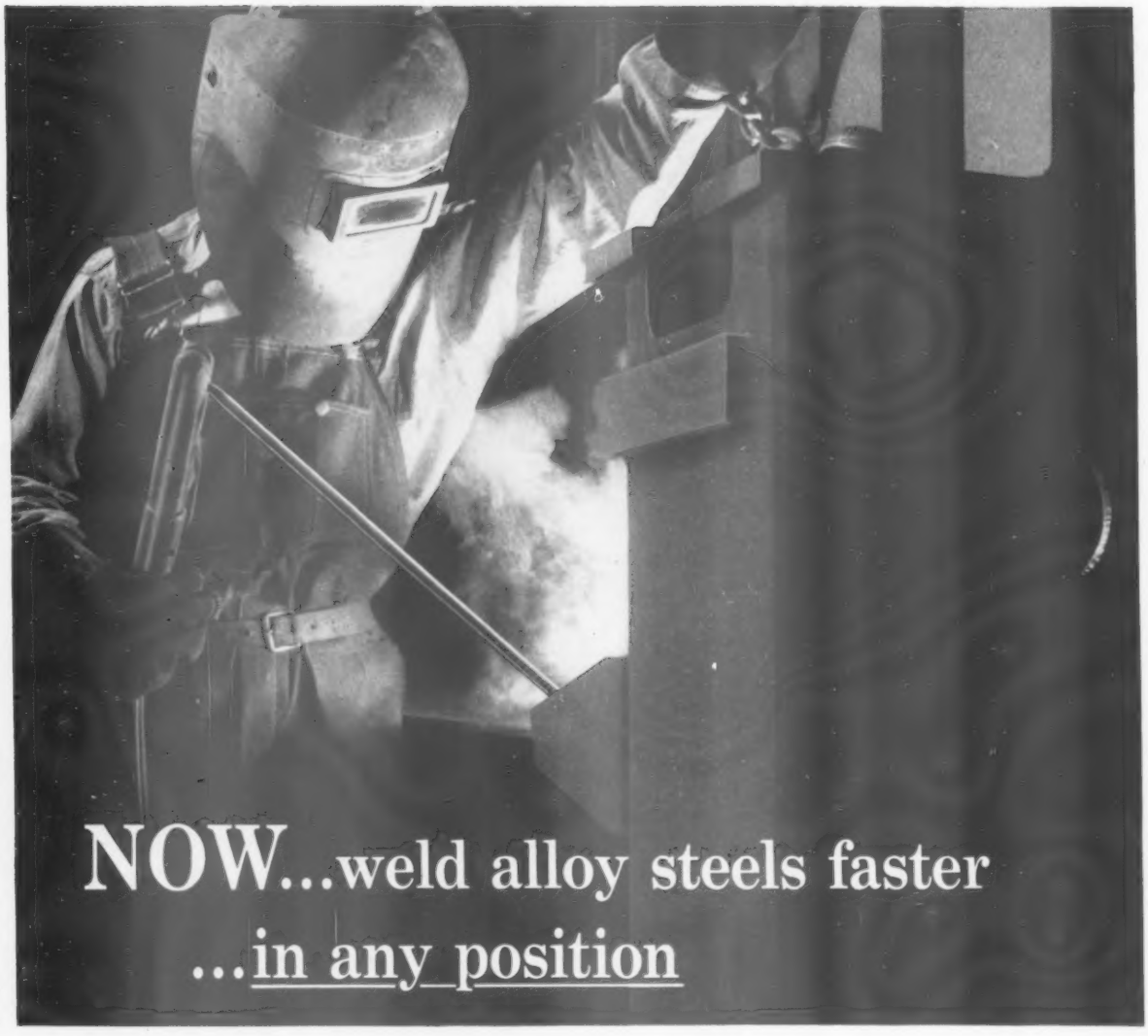
. . Dubuque, Iowa, is the site chosen for Harnischfeger Corp.'s new electrical equipment plant. Construction on a 75-acre plot is scheduled for Spring, 1958. Electrical controls, motors. brakes and hoists will be produced.

. . Improved welding methods and higher-grade steel have eliminated normal 4-in. insulation on a new line of high-pressure railroad tank cars produced by Advanced Products Div. of ACF Industries. Approved by ICC, the cars will transport liquefied petroleum gas and anyhydrous ammonia.



. . Tracerlab, Inc., Waltham, Mass., and its X-ray subsidiary, Keleket X-Ray Corp., have raised prices 10% on certain items in their line of X-Ray apparatus, nuclear instruments, chemicals and industrial process controls.

. . P. R. Mallory & Co., Inc., Sharon Steel Corp. and National Distillers & Chemical Corp. have formed the largest integrated company in the light metals industry. Production facilities of National, plus ownership of Reactive Metals, Inc. (now owned by National and Mallory-Sharon) will be acquired by Mallory-Sharon Titanium Corp., soon to be called Mallory-Sharon Metals Corp. and equally owned by the trio.



with P&H Iron-Powder Low-Hydrogen Electrodes

The cost-cutting speed of iron powder enables operators to deposit flat, smooth beads in *out-of-position* welding by simply dragging the rod. You get excellent feathering-out with exceptionally low splatter—and welds are practically self-cleaning.

In addition, you can get X-ray quality welds with little or no pre-heat, even on "difficult" steels, when you use P&H Iron-Powder Low-Hydrogen Electrodes.

Moreover, low hydrogen prevents underbead cracking and porosity, eliminating costly rewelds. And, because they have a mild steel core, these P&H electrodes cost less than the high-alloy types.

Bulletin R-29 can help you select the exact type of P&H Iron-Powder Low-Hydrogen Electrode you need for high-speed, all-position welding at low cost. Get your copy today. Write Dept. 326B, Harnischfeger Corporation, Milwaukee 46, Wisconsin.

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Stud-Welding

"It's a Pistol!"

FASTEST
SMALLEST
LIGHTEST
LOWEST COST

NELSON NS-10

GUN THAT FIGHTS HIGH FASTENING COSTS

IT'S YEARS AHEAD... the NELSON NS-10

Small, but mighty, this newest advancement in stud welding offers countless new opportunities in manufacturing and construction. The NS-10 is balanced like a pistol . . . gives you more welds per day with less fatigue . . . saves real time and money. Its slim profile lets you end-weld in close quarters and the light weight of the NS-10 makes it as portable as a handyman's ¼" power drill.

You can weld a full range of stud sizes up to ½" diameter.

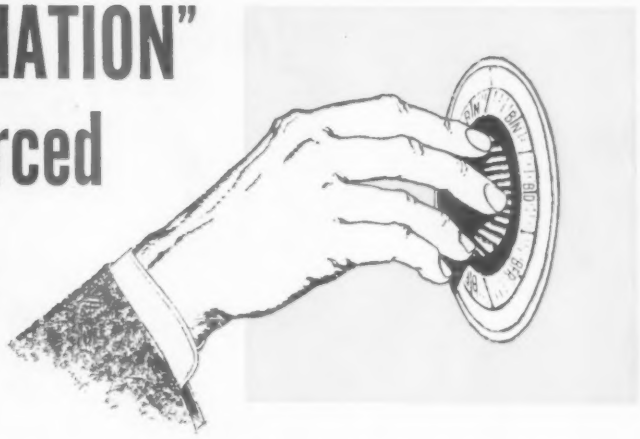
And it's NELSON ENGINEERED! That means you can *depend* upon your NS-10 to perform under rugged, continuous use. The NELWELD trademark, of course, reflects 18 years of stud welding experience.

Write for a descriptive folder—and try the NS-10 when you're at the Metals Show in Chicago. Booth No. 1476.

NELSON STUD WELDING, ***Division of Gregory Industries, Inc., Lorain, Ohio***

NELWELD®

The "RIGHT COMBINATION" for every reinforced grinding wheel



...because Norton builds in the "Touch of Gold"

In the complete line of Norton reinforced wheels you get the size, abrasive, reinforcing web and rubber or resinoid bond best suited to your work. These wheels bring you better production at lower costs . . . *because Norton builds in strength and safety that add the profit-boosting "Touch of Gold".*

In the many varieties of Norton reinforced wheels you'll find the just-right "combinations" that let you work fastest, safest, most profitably . . . your big advantages in dealing with the world's largest supplier of abrasives.

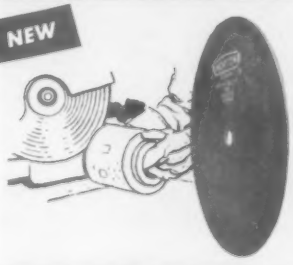
Also, Reinforced Mounted Wheels and Sticks

See your Norton distributor for further facts about reinforced abrasive products. Ask him for booklet No. 1748. Or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors all around the world.

RN WHEELS
Glass Cloth

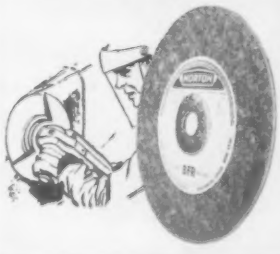
NEW

New — for the foundry and lower priced! Norton has been field-testing a new rubber-bonded-reinforced wheel. It's ready now and well worth your investigation for savings in your cutting-off operations on ferrous and non-ferrous metals.



BFR WHEELS
Cotton-Nylon

Top performers for light, portable grinding. These semi-flexible resinoid wheels have cotton fabric with an additional layer of Nylon for added safety. Specify A24KBFR for weld smoothing, removing scale, light finishing, minor cut-off jobs, etc.



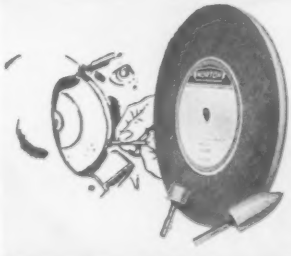
BN WHEELS
Glass Cloth

NOW — as thin as 1/16"

Ten-inch diameter wheels can now be had 1/16" and 3/32" thick. In this range specify A36TBN. For heavy duty work, requiring larger, thicker wheels, specify A24R14BN. Use them for slotting, for cutting-off non-ferrous metals, wire rope, many non-metallic materials.

BF WHEELS
Cotton

These resinoid straight wheels with cotton fabric reinforcement are "the right combination" for peripheral grinding, do a fine job of deburring and finishing. Fine for blending and smoothing light welds. Also available in mounted wheels and sticks.



BD WHEELS
Glass-Nylon

For fastest cutting on right-angle grinders you'll want the glass cloth reinforced resinoid bonded hub wheels of rigid type. Use for medium to heavy weld grinding and smoothing flame-cut edges. Specify A24NBD for fast cut, A24QBD for long life. For cutting-off, A24RBD which is Nylon reinforced.

W-1811

NORTON
ABRASIVES

Making better products... to make your products better

NORTON PRODUCTS
Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING DIVISION:
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USS TECHNICAL WELDING DATA

4

Weld Metal Properties

As an aid to the engineer and designer, here are the properties of weld metal deposited by a few types of available electrodes. Other very good types of electrodes are now on the market.

TYPICAL CHEMICAL COMPOSITION AND MECHANICAL PROPERTIES OF WELD METALS DEPOSITED BY HIGH STRENGTH ELECTRODES

AWS Class	Comp. Type	Weld-metal composition, % (undiluted deposit)										
		C	Mn	P	S	Si	Ni	Cr	Mo	V	Cu	Ti
E9015	Mn-Mo	0.07	1.45	0.025	0.024	0.39	0.06	0.08	0.35	0.02	0.14	0.013
E11016	Mn-Ni-Mo	0.08	1.02	0.015	0.030	0.28	3.73	0.01	0.63	0.005	0.11	0.014
E12015	Ni-Mo-V	0.06	1.12	0.011	0.018	0.40	2.11	0.11	0.95	0.21	0.11	0.005

AWS Class	Comp. Type	Condition	All-weld-metal tensile properties (0.505″ diam. specimen)				
			Interpass Temp., °F.	Yield Strength (0.2% Offset), psi	Tensile Strength, psi	Elong. in 2 in., %	Red. of area, %
E9015	Mn-Mo	As-welded	100	88,800	95,700	16.3	28.1
E9015	Mn-Mo	As-welded	Rising	61,750	84,600	29.0	62.5
E9015	Mn-Mo	Stress-relieved (1100°F.)	100	87,250	94,200	23.5	55.7
E9015	Mn-Mo	Stress-relieved (1100°F.)	Rising	67,500	82,500	26.8	63.1
E11016	Mn-Ni-Mo	As-welded	100	119,300	124,400	18.5	54.5
E11016	Mn-Ni-Mo	Stress-relieved (1100°F.)	100	106,200	113,400	21.2	58.6
E12015	Ni-Mo-V	As-welded	100	113,300	129,200	20.5	58.7
E12015	Ni-Mo-V	Stress-relieved (1100°F.)	100	116,000	128,700	18.8	59.4

AWS Class	Charpy-keyhole impact properties		
	Comp. Type	Condition	Ductility-transition Temp., °F.
E9015	Mn-Mo	As-welded	minus 155
E9015	Mn-Mo	Stress-relieved (1100°F.)	minus 83
E11016	Mn-Ni-Mo	As-welded	minus 166
E11016	Mn-Ni-Mo	Stress-relieved (1100°F.)	minus 90
E12015	Ni-Mo-V	As-welded	minus 78
E12015	Ni-Mo-V	Stress-relieved (1100°F.)	above 130
E12015	Ni-Mo-V	Quenched from 1675°F., tempered at 1175°F.	45 above zero

NOTE: Weld metals deposited by such electrodes on USS "T-1" Steel would have their chemical compositions altered by admixing of elements from the steel, and their yield and ultimate strengths would be increased.

REMEMBER THIS: No other alloy steel offers the combination of properties that "T-1" Steel possesses. Here, in just one steel, you get very high yield strength (90,000 psi minimum), extraordinary toughness, great resistance to impact abrasion, and good high temperature strength. These let you reduce the size of highly stressed parts . . . save weight, reduce the amount of welding required and cut your costs. USS "T-1" Steel is being used in bridges, excavating equipment, pressure vessels, towers . . . in equipment that must take heavy abuse in sub-freezing temperatures . . . in equipment that must withstand heavy stresses and impact abrasion at temperatures up to 900°F.

WRITE FOR COMPLETE INFORMATION about the application and fabrication of USS "T-1" Steel. United States Steel, Room 2801, 525 William Penn Place, Pittsburgh 30, Pa.

USS "T-1" CONSTRUCTIONAL ALLOY STEEL

"USS" and "T-1" are registered trademarks.

United States Steel Corporation, Pittsburgh • Columbia-Geneva Steel Division, San Francisco • Tennessee Coal & Iron Division, Fairfield, Ala.
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UNITED STATES STEEL

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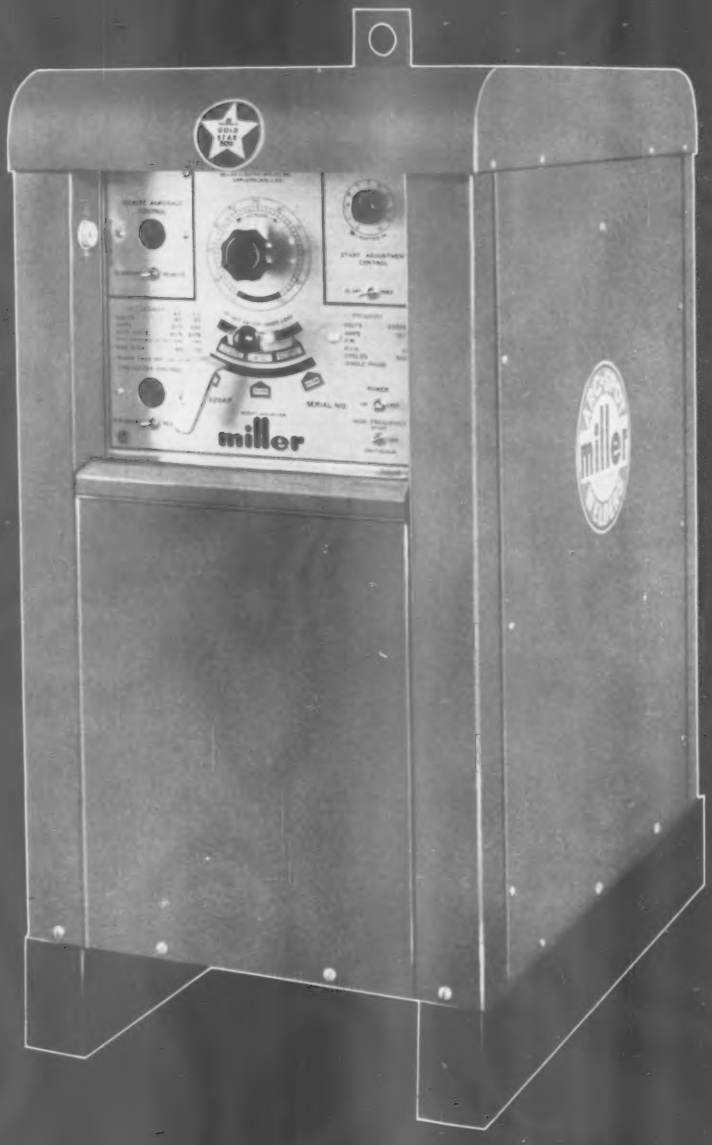

Here is the finest in inert gas and metallic welding

Complete particulars sent on request

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APPLETON, WISCONSIN
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IT'S THE *MOST

ANNOUNCING

the Sensational *NEW*

miller GOLD STAR SR

It ***DELIVERS*** maximum arc stability for:

a. Sounder, denser welds – and more of them – in less time, with . . .

b. ALL electrodes, in . . .

c. Any and all positions

How is this performance possible? THE MILLER GOLD STAR SR introduces a...

NEW transformer

plus

NEW weld stabilized current

plus

NEW completely sealed semi-metallic rectifier

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

Tested across the country by practical, critical, hard-bitten working weldors, here's what they say about the new Miller GOLD STAR SR:

"it's the DC performance I've always wanted"
"here's DC welding current that's . . . perfect!"
"positively handles ALL electrodes better"
"best deal I've seen for v and o work"
"easiest arc starting in my experience"
"smoothest arc I ever used . . . and . . . quiet!"
* "it's just plain the MOST"

Complete particulars on the MILLER GOLD STAR SR, including inert gas and automatic fixture welding, is now available on request.

". . . if it's Miller you know it's the finest . . ."

miller ELECTRIC MANUFACTURING CO., INC. APPLETON, WISCONSIN

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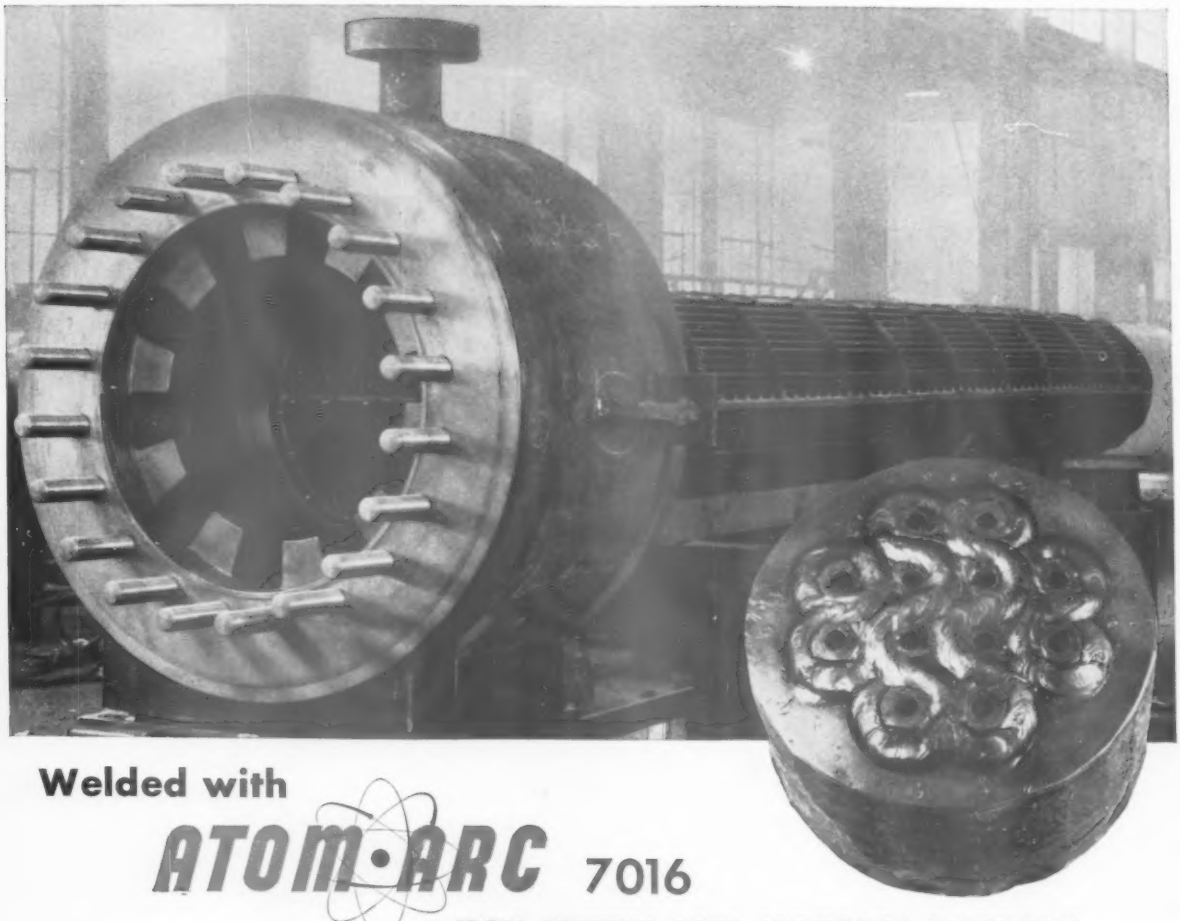
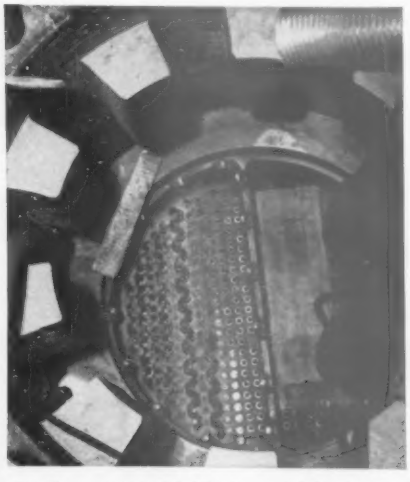


Welded with ATOM•ARC 7016

IRON POWDER LOW HYDROGEN ELECTRODES

welded by GRISCOM-RUSSELL CO.

An unusual welding technique was used in welding the tubes in this heat exchanger to the tube sheet. In the inset above is a test plate which shows the method in which the weld beads were used to join the A210 steel tubes to the SA266 forged steel tube sheet. Below is a close-up of the actual work.



The Griscom-Russell Co., having manufactured thousands of heat exchangers for the refinery and chemical process industries, are experts at producing high quality welds in accordance with pressure vessel codes. The selection of iron powder low hydrogen electrodes for critical manual welding applications is a good example of their "trend setting" thinking. For Griscom-Russell, as have hundreds of fabricators, recognized the almost unlimited possibilities of this electrode development. •

Atom • Arc 7016 all position iron powder low hydrogen electrodes were the first to provide the quality of low hydrogen welds within the cost range of mild steel weld deposits . . . and in many cases at a savings over mild steel weld metal.

On your next weldments where *quality* is essential specify the X-ray quality of iron powder low hydrogen weld metal . . . order Atom • Arc electrodes. There is an Atom • Arc grade for every mild steel or low alloy steel application, including Atom • Arc T for welding T-1 steel. For complete details, write: Alloy Rods Co., P. O. Box 1828, York 2, Penna.

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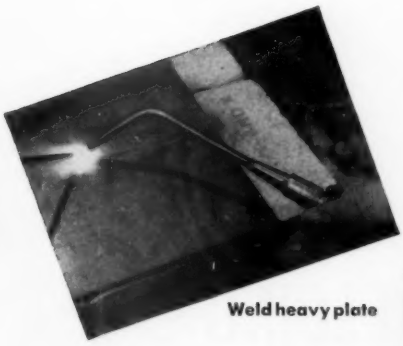
NO FINER ELECTRODES MADE . . . ANYWHERE

Weld sheet metal



Weld heavy plate

Handle heavy heating

NOW . . . . one blowpipe handles all your welding, cutting and heating needs

New OXWELD W-47

Cut metal

Here's another LINDE "first" . . . the all new OXWELD W-47 Welding Blowpipe. Backed by more than half a century of experience and engineering skill, the new W-47 Blowpipe offers you a host of efficiency-increasing features never before available in a single welding blowpipe.

Widest Work Range—Weld sheet metal as thin as 28 gage or the heaviest plate. Convenient cutting attachment quickly converts the W-47 to flame-cutting work on metal up to 8 in. thick.

Largest Flow Capacity—Handle any oxygen or acetylene flow from 2 to 300 cu. ft. per hour. With fuel gas heating heads you can handle total gas flows up to 1500 cu. ft. per hour!

Improved Mixer—New cartridge-type mixer in each head provides thorough, proportionate mixing of gases and prevents flashback—*at all working pressures.*

Trouble-Free Construction—New features include "O" ring gas seals, self-seating valves, and spring-lock welding heads. Stainless steel mixing tubes keep the blowpipe handle cool even during 'round the clock operation!

Full Selection of Accessories—The W-47 offers the largest selection of accessories ever available for use with one blowpipe. In addition to standard welding heads and cutting attachment, a full selection of accessory equipment for flame-priming and descaling is available.

TRY THE NEW W-47 IN YOUR SHOP

Take advantage of all the new features of the OXWELD W-47 in your own shop. Call your nearby LINDE office to arrange for a demonstration or write for free booklet F-1107. Do it today!

LINDE COMPANY DIVISION OF **UNION CARBIDE** CORPORATION

30 East 42nd Street, New York 17, N. Y.

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WELDING CABLE

IF IT CARRIES CURRENT, KW CARRIES IT!

LIGHTEST WELDING CABLE EVER MADE: REDUCES FATIGUE, GETS MORE WORK DONE

Made of Kaiser Aluminum . . . one third the weight of copper cable

Ask the man who's worked with both. *He'll* tell you there's a difference!

He'll tell you that lightweight KW welding cable is easier to lift . . . easier to drag around.

He knows what this means when he's on the job—in greater freedom, greater efficiency.

And, for more energy left after a day's work, he'll tell you KW's light weight helps plenty!

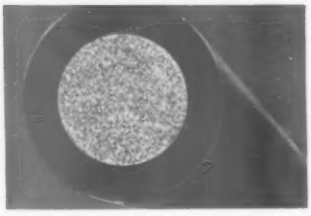
Then . . . compare KW's price and ask YOURSELF this question: "Isn't KW aluminum welding cable the most practical answer of all for MY welding cable problems?"

KW welding cable is produced for equipment manufacturers by Kaiser Aluminum at the company's Newark, Ohio wire and cable mill. For complete information, contact your welding equipment manufacturer or supplier.

Kaiser Aluminum & Chemical Sales, Inc., *Executive Office,* Kaiser Building, Oakland 12, California; *General Sales Office,* Palmolive Building, Chicago 11, Illinois.

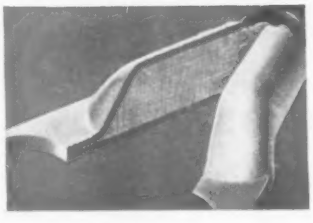
Yet that's only part of the story . . .

FLEXIBLE to make work easier! KW cable is so flexible that it can easily be looped with thumb and forefinger. The fine aluminum wires used assure maximum flexibility—plus toughness and long-life durability.



DURABLE to withstand hard use! KW's tough GRS rubber jacket resists abrasion, acids, sunlight and heat. For extremely hard usage, KW's fireproof neoprene jacket offers maximum resistance to abrasion, acids, alkalies, grease, oil, sunlight, heat.

RUNS FAR COOLER! Aluminum dissipates heat faster than copper cable of equivalent size. As a result, an aluminum cable is cooler and more comfortable to handle.



EASY TO SOLDER to make good connections! Both soldered and mechanical connections are simple to make with KW aluminum welding cable—whether aluminum to aluminum or aluminum to copper in cables, terminals and accessories.

Kaiser Aluminum

IF IT CARRIES CURRENT, K/W CARRIES IT!

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The Aircomatic arc welding process using carbon dioxide gas as the shielding medium, means high economy and speed in certain mild steel welding applications.

Fabricators of mild steel products such as car frames, fuel tanks, water heaters, trailer frame supports and pedal levers report outstanding results and substantial savings through this new technical development.

This combination of Aircomatic equipment (manual or automatic) and CO_2 is particularly recommended for high production work where the faster welding speeds and the inexpensive shielding gas will most benefit the cost conscious user. It is an ideal process for single pass applications and multiple pass applications. Joining sections of large diameter steel pipe is but one example.

If you weld mild steel, investigate the possibilities and advantages of using the Aircomatic process in your particular operation. Complete information and literature is available. Write Airco today!

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BETWEEN PASSES

a change is made

When the American Welding Society announced a while back that the annual welding show would return to Buffalo in 1959, there were quite a few cries of "how come?" Well, the cries have been heeded—not with an explanation, but with a change. The 1959 meeting and show will be held in Chicago instead. Most of the objections to Buffalo (including those from this corner) were not against the city itself, nor its facilities, which are more than adequate at present. But a great number of us wondered why one city should host the show for a third time in so short a period, when there were many other virgin sites. Incidentally, the 1960 show is headed for Los Angeles.

right direction

We've talked often about education in welding and the greater need for engineers trained in *welding*. Therefore, you can imagine our pleasure when we heard about Air Reduction's establishment of a fellowship in welding engineering at Ohio State University (see news story on page 5). The country (and the industry) needs similar action from other large firms in the field.

scientists and traps

Quote from the Red Hook, N. Y., *Advertiser*: "We have nothing against scientists. Without them, the world wouldn't be where it is today. But we wish that some of them, at least, would stop trying to build bigger and better bombs and concentrate on something like a mousetrap that can't slam back on your finger."

a champion!

Chet Lampson is 81 years old, but he still edits the weekly Jefferson, Ohio, *Gazette*. And his age is no barrier to a fight, either—especially against big government. Lampson received a notice from the Internal Revenue Service demanding payment of an alleged income tax bill of $9. Since he felt he didn't owe the money, Lampson was angry, but his blood really boiled when he read the insulting words of the letter and its threats of attachment of income and seizure of property. In addition to using the columns of his paper as a weapon, Lampson wrote the President, certain members of Congress and other federal officials that, "No agency of government should be allowed to insult any citizen, or deny him his constitutional rights . . . on a mere assumption that the taxpayer is a wilful violator of the . . . law." His campaign got results, for we hear that the wording of that form has been changed, giving it a more courteous tone.

Washington letter

Our editorial which appeared in the July issue has had an added circulation. One of our regular readers ordered reprints, and with a covering letter had them sent to all U.S. senators.

more recognition

Welding Engineer's Research Dept., whose statistical findings are universally accepted as the industry base, recently received recognition from outside the welding field. Our sales and production figures for industrial gases were quoted in Investors Advisory Institute's *Bulletin*. The IAI is a subsidiary of Forbes, Inc., publisher of the famed business publication of the same name. The *Bulletin* is an investors' guide to the stock market.

origin of species

No point beating about the bush. We moderns aren't as know-it-all as we like to think. On checking into Webster's definition of *weld*, we found ourselves scrunching down in our seats a little as we realized that the English used the word long before the first torch was ever lighted. They used it in referring to a sunny flower which is used as a dye. As a matter of fact, our use of *weld* comes from the Middle English *wellen*, meaning to pour forth or to flow.

some weeks!

October includes some terrific weeks, which we're sure all of you out there in magazine-land will want to enjoy. So watch your calendars for:

Save the Horse Week, Oct. 13-19;

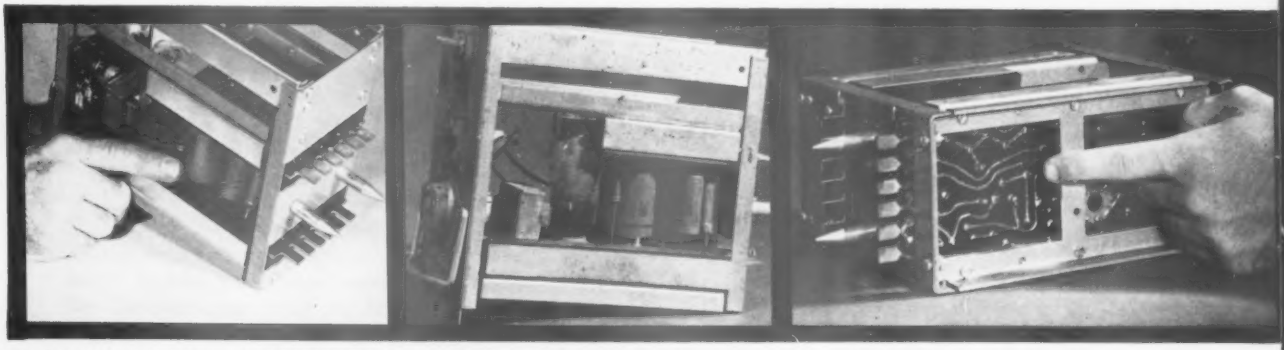
Certified Washable Week, Oct. 13-20;

National Wine Week, Oct. 14-21;

National Macaroni Week, Oct. 17-26;

Pass the Laugh Week, Oct. 20-27.

NEW G-E RESISTANCE-WELDING CONTROLS come in two lines to meet ***any*** non-synchronous application. ***Standardline*** combinations—using standard NEMA sequence timers—are specifically for normal welding applications. ***Customline*** combinations use unit timers to provide any control sequence needed on special-purpose, multi-electrode, or automated machines.



4 **CIRCUMFERENTIAL ARRANGEMENT** of circuit components permits quick replacement and easy accessibility.

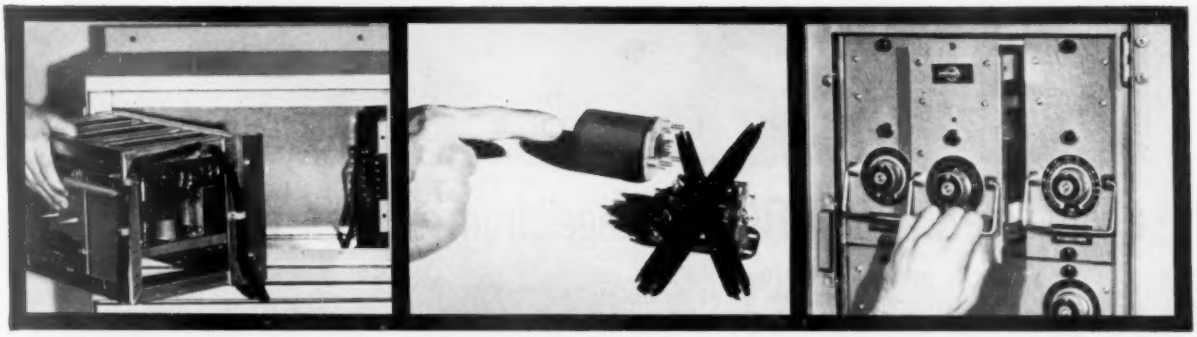
5 **RUGGED DESIGN** gives optimum resistance to adverse conditions such as dirt, moisture and vibration.

6 **NEW CIRCUITRY** provides greater accuracy, more consistency, and less sensitivity to line-voltage changes.

Specify General Electric's NEW *cost-cutting* non-synchronous controls for your next resistance-welding application. For more information, write to Section 794–2, General Electric Co., Schenectady, N. Y., for bulletins GEA-6408 (Standardline) and GEA-6593 (Customline). *Specialty Control Dept., Waynesboro, Virginia.*

7 REASONS WHY GENERAL ELECTRIC'S NEW NON-SYNCHRONOUS CONTROLS

Cut your welding maintenance time and costs



1 **SWING-OUT FRAMES**—exclusive General Electric feature—speed installation, inspection and maintenance.

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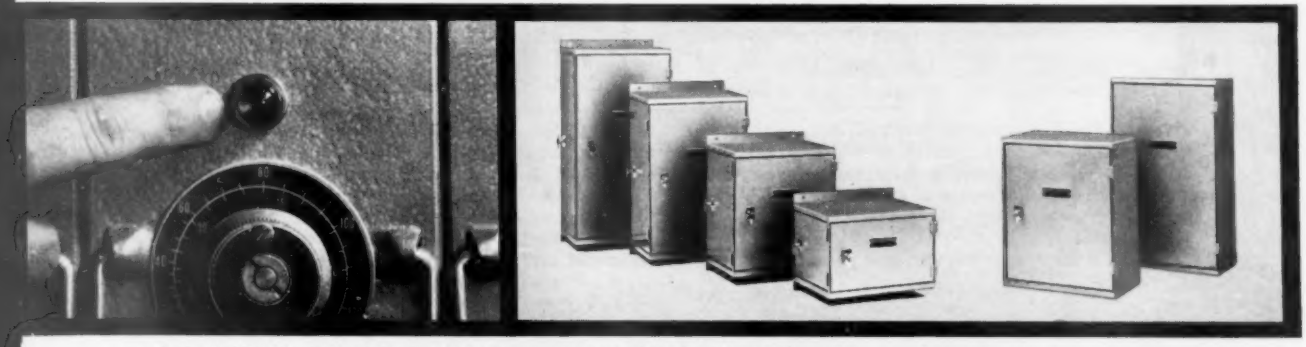
3 **DRAWER-TYPE PLUG-IN UNITS**—used throughout—provide maximum flexibility, exchangeability of components.



7 **OPERATIONAL INDICATING LIGHTS** spot and give visual indication of trouble, thereby reducing downtime.

FULL-LINE SELECTION—choice of 4 control cases and 2 contactor cases—means you can buy for present and future needs! "Building-block" design gives maximum flexibility for assembly of combinations, a simple way to add control.

Progress Is Our Most Important Product

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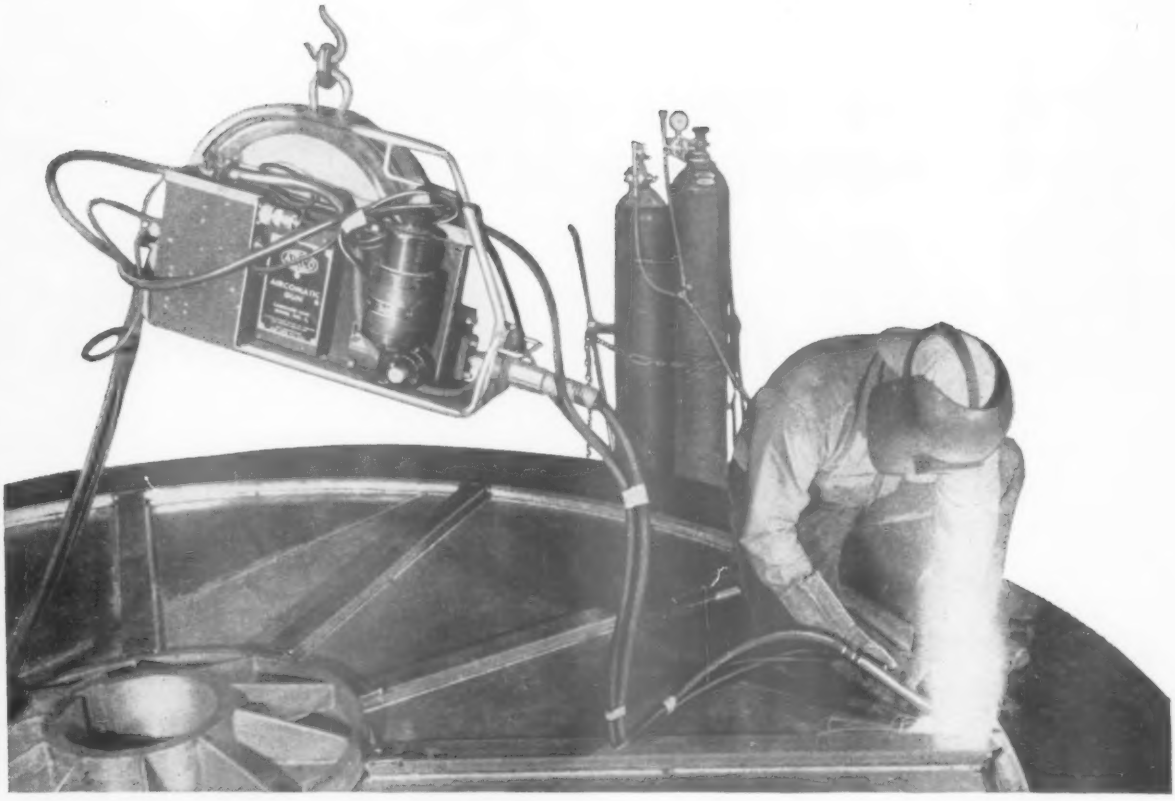

a complete AIRCOMATIC® "package"...from recommendation to results

Aircomatic welding is an inert-gas, shielded arc process using a consumable wire electrode. The basic unit, manual or automatic, designed and manufactured by Airco, includes the welding head, carriage assembly for wire drive and control equipment, cables, hoses, and flexible wire casing.

The consumable wire electrode is produced to rigid Airco specifications as to purity, cast, and metallurgical content. Normally supplied on expendable spools, Aircomatic wire is available in aluminum, steel, stainless steel, nickel, titanium, copper, and copper base alloys.

Airco shielding gases include both helium and argon, produced by Airco, or mixtures thereof for particular requirements. Pure carbon dioxide gas is also available from Airco for use as a shielding medium where applicable.

Aircomatic is a direct-current welding process. A complete line of Airco motor-generator and rectifier type welders are designed for Aircomatic characteristics—the latest of which is a new 800 amp ACV welder.

The Aircomatic process was invented, designed, developed, and licensed by Airco. Airco's nine years of experience have given the metal working industry an inert-gas process that welds all kinds of metals – adding speed, economy and versatility to every suitable application.

An Airco Representative can give you a completely unbiased opinion as to how Aircomatic can best be employed—because—Airco is a leading manufacturer-supplier of all types of oxyacetylene, metallic arc and inert-gas shielded welding and flame cutting processes, their controls, supplies, and accessories.

Other Airco inert-gas welding processes include Aircospot and Heliwelding. Write today for details.

welding
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Bay State abrasive engineer Don Kennedy put in enough years in the Navy to learn about rust removal and other grinding jobs the hard way. Whatever your company's grinding problems may be, you'll find Bay State representatives like Don Kennedy ready to help and competent to work out practical solutions.

They're wearing his "hat" wheels* ...and they wear well

When Bay State's now-famous *"hat" wheels** were first introduced at a large East Coast shipyard, they caused quite a sensation. Here were revolutionary new grinding wheels that tore off metal like cup wheels but were much less heavy . . . that handled as easily as coated abrasive discs but cut faster, lasted longer and did more work at lower cost.

In addition to outstanding product performance, however, Bay State offers prompt, intelligent service. Sales engineer Don Kennedy not only works with top supervisors; he gets out on the job with the operators and digs into their problems, too.

As a result, his recommendations are both practical and specific . . . Blue Flash for speed and heavy stock removal . . . Bayflex to resist loading on soft metals . . . Saf-T-Cut for longer life on hard, jagged surfaces . . . DuraCut for blending and finishing broad areas.

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300, 400 and 500 Amps. models (left)

180, 250 Amps. models (below)

BULLETIN
SB-1350
contains construction details and specifications. Bulletin SB-1343 tells what it will do for you. Write for them.

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OCTOBER, 1957

Welding Engineer

ESTABLISHED 1916

Needed: willing hands

THE WELDING industry is falling down on the job!

Millions of people—including those not connected with welding who ought to be told of its vast importance to them, as well as those who can benefit directly from welding information—are being left to sit on their hands.

While our nation's engineering schools should be initiating programs to meet the growing demand for graduate welding engineers, they are actually curtailing their shop courses.

College graduates won't dispute the fact that books are a vitally important educational tool—that no one can be properly schooled without access to the valuable and varied experiences they record. But, in our opinion, the student engineer without shop experience is still lacking many of the skills he'll need to do a good job.

How can an engineer design a machine or a product if he knows nothing about the operation of tools required to turn out the working model? The graduate doesn't have to be a skilled machinist or weldor—but he certainly should be conversant with the skills of such craftsmen.

Yet, today, as we witness cut-backs in college shop courses, we are actually watching a large part of the student engineer's curriculum being tossed out the window.

IN GRAMMAR schools, a current fad is eliminating grade cards because Junior is likely to "get a complex when he sees others receive higher grades." The *progressive* educators who have foisted this tragicomic situation upon us obviously disregard the fact that Junior will be thrown into a competitive society in a very few years.

Is the currently apathetic attitude toward shop courses simply an engineering school's way of following suit? Are they afraid that dirty hands will also give Junior a "complex"?

If he wants to be the kind of engineer most employers look for, Junior had better not be afraid to dirty his hands. The ability to use his hands as well as his head is important to the successful engineer—just as important, in fact, as a good command of the English language.

It is fairly easy to draft a weldment, yet the average designer who completes a really fine blueprint hasn't the slightest conception of the manner in which welding will join components. The "classroom engineer" will have a broader knowledge, plus the ability to take advantage of welding's weight and cost savings.

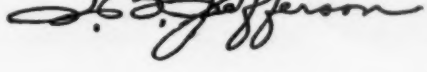
BUT EVEN the latter could not hope to compete with the engineer who has received his training in both the classroom and the shop. This man knows intimately how the skilled hands of a shop worker can convert his design into an economical and highly functional product. He knows the physical abilities and limitations of the weldors with whom he works, and he can talk to these shopmen in terms they understand.

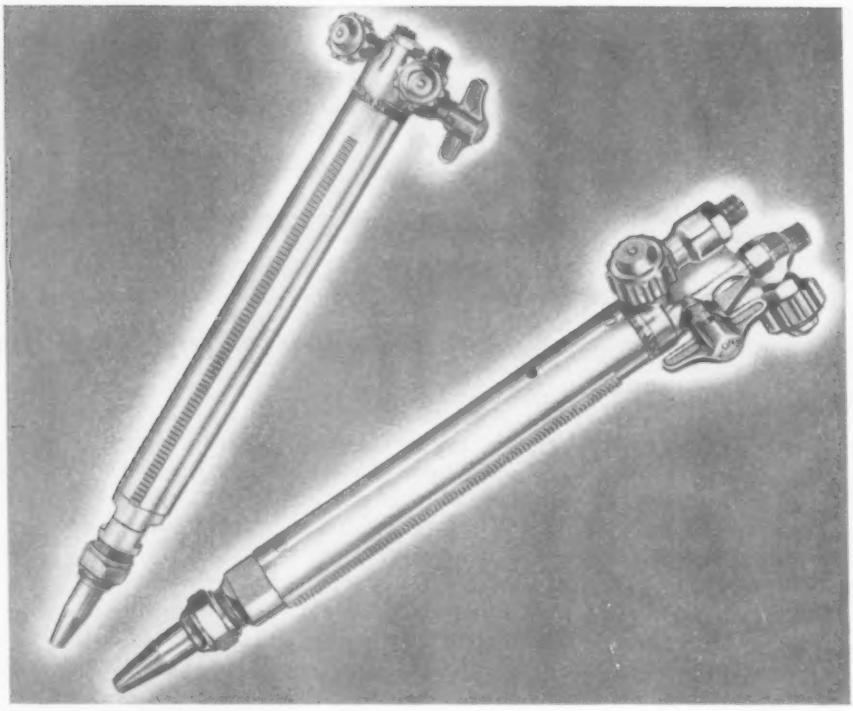
The three engineering schools in the U. S. which offer degrees in welding engineering recently told WELDING ENGINEER that *each* 1957 graduate received from 10 to 20 job offers. Could this possibly be the case if all of us were stimulating additional courses in welding engineering?

American industry's need for welding engineers, technicians and weldors isn't diminishing—it's growing in startling proportions. And, in the final analysis, it's up to you to determine whether engineering schools are going to be "sold" on the improvement and expansion of their welding courses.

Don't fear a personnel increase in the welding industry. The more people we have, the more business there will be for us all. If you can't view the problem in any other light, look at it selfishly: your future hinges on today's promotion of welding and welding education.

Can the industry count on you?





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HIS lenses are right for him. Are yours correct for you?

Don't have a "see" of troubles . . .

Eye safety is job safety— check yours

By Dr. Milton Ross

WELDING, certainly one of the most challenging and financially rewarding of all industrial positions, still presents certain hazards to the unwary.

And one of its chief dangers is damage to unguarded eyes.

Working with a super-brilliant welding arc, the weldor's eyes can be exposed to harmful rays, both visible and invisible. For example, an arc discharges invisible ultra-violet rays, similar to those given off by the sun. These rays can create a sunburn effect, severely irritating to the eye and its membranes.

Other Rays

Another invisible ray is infra-red light which, it is thought, causes cataracts, retina injuries, and opacity of the cornea and aqueous chamber. The third ray emitted by the arc is visible light—which can lead to eye-strain and temporary blindness.

It is apparent, then, that a protective lens over the eyes must not only shield the weldor against the sparks struck by the arc, but also must filter out invisible rays.

Yet, how often do we find a weldor selecting a welding lens or goggles with the same indifference he shows in choosing between two soft drinks? Too frequently. Even though his earning power depends upon his eyesight, many a worker snubs this vital facet of his job.

Fortunately, a majority of weldors *do* concern themselves with their eyes, and make it a point to choose the proper shade of lens for their work. But while dangerous rays may be shut out, there is still the threat of *eyestrain* caused by improper distances between the eye, the glass bar in the welding hood, and the workpiece.

The American Medical Association has published results of a thorough examination of visual acuity. "Visual acuity" is a medical term for the eye's ability to distinguish objects clearly under varying circumstances. In the work, *Appraisal of Visual Acuity*, the AMA found it had previously overestimated the ability of the eye to distinguish objects clearly at close range.

Re-Evalautions

Researchers found that at *near-vision* ranges (an area extending approximately 2-in. past the fingertips of an extended arm), objects of less than 3/32 in. were not being seen as well as they had supposed.

How does this affect weldors? Most arcmen do work at near-vision ranges, and although lenses tend to make weld and electrode appear larger, they sometimes place an intolerable strain on the eyes.

This strain often produces headaches, dizziness, eye aches, burning sensations, and even nausea. More important than these discomforts, however, is the fact that eye-to-lens positioning can actually weaken eye strength to the extent that a young man will develop symptoms and eye behavior patterns of a man 65 years old.

Since most weldors do not own their hoods or goggles, they generally draw lenses from the tool crib. Made of ordinary plate glass, in most instances, these lenses cannot correct eye conditions which already exist—or protect deficient eyes from further harm.

Eye Behavior

Visual acuity of a weldor is increased while he is arc welding. The amount of light given off by the arc causes a high contrast between the weld and its background, enabling the weldor to see more clearly.

However, this gain of acuity is likely to lull him into believing his eyes are adequate for the job at hand. This is not always true; the distance of the lens from his eyes or a workpiece is often incorrect for maximum efficiency of eye function. This situation may be particularly critical if the weldor wears spectacles.

Wearing glasses not corrected for welding, leads to eye problems. If the lenses are too weak, working range is increased but visual acuity decreases. Lenses which are too strong may extend the range of visual acuity but restrict working range.

Only spectacles which give maximum visual acuity and a focal point on near-vision ranges should be worn.

Many weldors use welding lenses a lighter shade than is specified for the type of welding they do. They believe this stretches their working range . . . and it does. Unfortunately, it also weakens the necessary protection against damaging rays. Continuing this practice can lead only to irreparable harm to the eyes, or even permanent loss of vision.

A good weld can only be made when the weldor has clear, correct vision, freeing him from distress which so often can be traced to poor eye protection. In short, prescription-ground welding lenses will insure his continued value to his employer and to himself.

Best automatic d-c source? . . .

". . . CV eliminates troublesome variables found on conventional systems."

Constant voltage power

By J. H. Headapohl
Automatic Welding Div.
Hobart Brothers Co.

THE SIMPLICITY of their control systems is the primary reason constant-voltage power sources are gaining rapid popularity in the automatic welding field.

Progress in automation of equipment is often equated with complexity; this need not be true with constant-voltage.

Constant-voltage (CV)—or constant-potential, as it is sometimes called—is not a newcomer to the power source area. In the past, constant-voltage generators were used for manual arc welding by the addition of resistance controls to the machine. And even before welding was introduced as an industrial tool, constant-potential eight-hour battery chargers had been in use for some years. But the history of CV as a power source for automatic welding is fairly recent.

What is constant-voltage? Its characteristics are perhaps best seen in comparison with other power sources.

Most welding machines in general use today—par-

". . . an extremely versatile power source for submerged-arc welding."

Variable Voltage

By Robert A. Wilson, *Director*
Application Engineering
Lincoln Electric Co.

THE MOST widely used power source for submerged-arc welding is the direct current variable-voltage motor-generator.

Although other power sources have special advantages for specific applications (a welding engineer should be consulted on their use), d-c variable-voltage m-g generally is best for submerged-arc work.

While the features of this power source are summarized in the term "d-c variable-voltage m-g," each of the three segments will be analyzed for performance.

Direct Current

Direct current flows in one direction and concentrates more heat on one side of the arc than on the other. Because of this characteristic, it is possible to change polarity and so direct heat either on the electrode or on the workpiece, whichever best fits the job at hand.

When working with the submerged-arc process, this

". . . power factor . . . over 90% at all ranges . . . reduces input requirements as much as 50% with comparable output."

CV rectifiers

By George G. Glenn
Vice President
M & T Welding Products Corp.
Oakland, Calif.

MANY OF THE problems in automatic welding power sources can be traced to their beginnings in manual welders.

The adaptation of power sources used on manual welders led to relatively high open-circuit voltage and a characteristic "drooping curve" voltage drop under loads.

Too, arc length has a direct relationship with voltage drop across the arc. In manual arc welding, the operator can adjust his electrode speed as he sees need for it. But to do this automatically requires elaborate controls to transmit arc voltage variations to a corresponding change in electrode feed rate.

Time Lags

Unfortunately, even the best controls can correct a variation only after it occurs. An inevitable time lag takes place as controls adjust motor speed, overcome

. . . 3 experts present their views

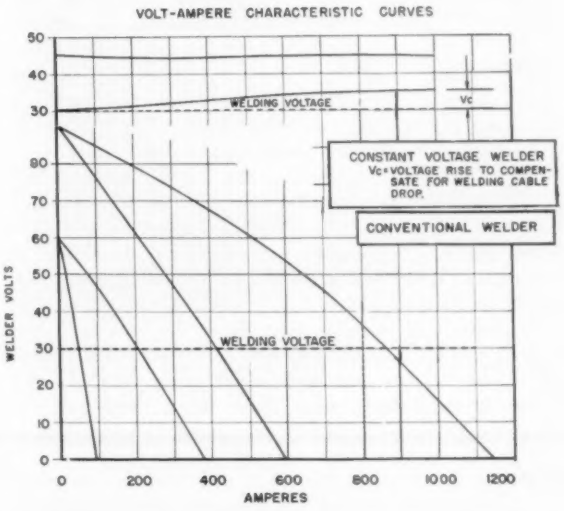
ticularly in manual arc welding—are constant-energy types. Watt output in these machines is approximately constant (volts times amperes), and open-circuit voltage is comparatively high.

As the load (amperage) increases, voltage decreases. A drooping volt-amp characteristic curve results, as shown in the illustration.

On the other hand, voltage remains approximately constant regardless of the load placed on a constant-voltage motor-generator.

The CV m-g set automatically adjusts proper welding amps for any condition. Other factors remaining the same, the rule is: the faster welding wire is fed into a welding zone, the higher the amperage from the welding machine. In short, wire-feed rate governs welding amperage.

The simplicity of CV might lead some to believe that its applications are limited. This is far from the truth,



allows either maximum deposition with minimum penetration *(negative polarity)* or minimum deposition with maximum penetration *(positive polarity)*.

Most submerged-arc problems can be solved by use of one polarity; both do not work equally well on the same job. For example, square-edge butt welds on ½-in. stock require maximum penetration with minimum deposition. On the other hand, automatic submerged-arc hardfacing demands maximum deposition with minimum penetration.

In general, however, d-c is best on *all* submerged-arc applications, except when arc-blow cannot be otherwise eliminated, and on multiple-head arrangements when arcs are in close proximity and a magnetic disturbance exists between them. Such situations call for a-c which, although it lacks selective polarity, does reduce magnetic disturbances and gives better arc control.

Low-cost, extremely accurate controls required for irregular contour welding is another advantage provided by d-c. In critical work, a combination of a d-c shunt motor and a control exciter add accurate voltage control, again at low cost. Less precise controls—though at lower cost—are given on not-so-critical work when a-c is used.

Variable-Voltage

Characteristic of a variable-voltage power source is an open-circuit voltage at the machine that is considerably greater than arc voltage. The output volt-amp curve, therefore, slopes steeply. A small change in current will result in widely varying voltage in a power source of this type.

The variable-voltage machine should not be confused with a constant-voltage power source. Even slight voltage variation in the latter produces large current changes.

The steeply sloping volt-amp characteristic permits a variable-voltage power source to supply a current steadier

inertia and overtake backlash in the driving head gear train. In high-speed welding this often results in excessive irregularities and defective welds. Little can be done except reject pieces or reweld.

Because many difficulties in automatic welding could be traced to variable arc voltage, interest increased in constant-voltage power sources. Experts believed if arc voltage could be fixed at any desired preset value and remain constant—regardless of arc conditions—these problems could be solved.

And so, early in 1952, we developed a rectifier constant-voltage power source. It consists of a three-phase auto-transformer, a power transformer, and a selenium rectifier bank in a special low-resistance, minimum-induction circuit.

Voltage drop between open-circuit and loaded conditions is very small (4-8 volts) and variations during welding are negligible (½ volt or less).

This setup offers many advantages over previous motor-generators with constant-potential power sources. Its power factor is over 90% at all ranges and it has high efficiency which reduces input requirements as much as 50% with comparable output. Instant arc starting and recovery, important factors in automatic welding, are also given.

Arc Voltage "Fixed"

When arc voltage is fixed at desired preset values, many variable-voltage welding problems disappear. For example: there is no need for voltage-controlled electrode feed because it remains constant at the chosen deposition rate.

If a tack weld momentarily shortens the arc, current (amperage) instantly increases to burn off the electrode faster. Again, if the welder encounters an area of poor fit and arc length increases, amperage will drop to slow

CV . . .

for CV can be used on all submerged-arc processes and on the Mig (metal inert-gas) process. It is also outstanding on both automatic and semiautomatic work.

Feed Back

Because wire feed rate adjusts welding amperage, CV eliminates troublesome variables inherent in conventional systems. A constant-speed wire feed motor results.

Before the use of constant voltage, a complicated feed-back control system was necessary to control welding wire—and difficulties arose. With CV, however, any electrical problems or maintenance work can be done by the average shop electrician, a definite advantage in this age of specialization.

In addition to complex controls of the feed-back system, signals are continuously sent to the wire-feed motor that cause it to change speed as it meets varying conditions in the welding zone. Many times, these controls encounter tack welds, partly fitted weld joints, and uneven joint gaps which causes them to over-control the wire. This may result in burning through material when the wire-feed motor does not respond fast enough.

Such conditions have little effect on constant-voltage wire-feed systems.

This is not meant to imply CV will overcome poor design or joint fitup. But the power source *does* tend to lessen effects created by these problems.

Instant Starting

Instant arc starting is assisted by a huge surge of current coming from the CV power source. Not only do the volt-amp characteristics wound into the m-g initiate the arc, but help also is given by the fly-wheel effect of the motor-generator.

Once the arc has been struck, fast response of the motor-generator brings current to normal welding values. Because of this, burn-back, or fusing of welding wire to the end of the current contact tube in the wire-feed

VV . . .

than that of a constant-potential unit when both are used on low-current-density applications.

Current affects arc force and deposition rate—so the steadier the current, the better the weld. This can readily be seen on large welds and circumferential welds when complete control of the molten metal is mandatory.

On these applications, current fluctuations may disturb a normally quiet weld pool to such an extent that satisfactory deposits are impossible. Variable-voltage power sources *must* be used here.

Special Applications

The most prevalent method of arc striking is the "cold start." The electrode is in contact with the work when current is applied; as the current flows through the electrode, it is lifted from the workpiece. With its high open-circuit voltage and moderate current change, variable-voltage is much more satisfactory than constant-potential heads. Arc starting is smooth and reliable.

Difficult welding operations, such as corrugations and other instances when arcs must follow a contour in vertical planes, are simplified by using variable-voltage units. Controlled arcs float up and down over corrugations; an arc powered by a constant-potential source tends to cut through them.

It is important to note that welding current does not change with arc voltage, although arc voltage may vary considerably on wire-feed motors. Variations in welding current in such situations result in irregular bead width and uneven penetration.

Another application where a variable-voltage power source is a "must" is in hardfacing when single beads up to 3 in. wide are made by oscillating the welding head about a pivot transverse to travel direction.

Distance between the bottom of the welding head and work increases at the limit of the swing, like a pendulum. And because of this greater distance, arc voltage is mechanically increased. Nevertheless, a variable-voltage power source with high open-circuit voltage and steady

CV rectifiers . . .

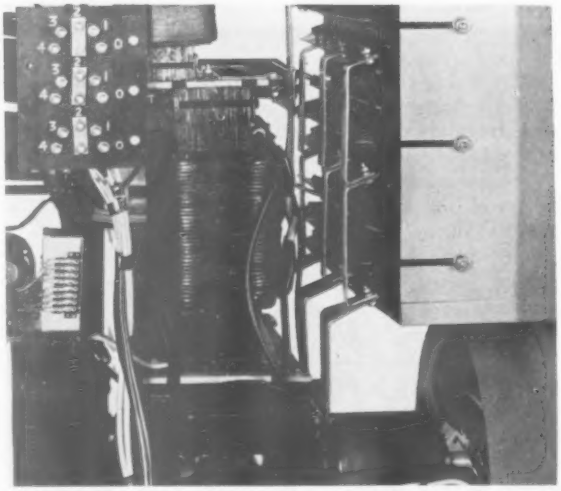
burn-off. Reaction is virtually immediate because it is electrical, not mechanical. This makes automatic welding truly automatic and the necessity for complex, voltage-controlled wire feed devices disappears.

On submerged-arc welding, too, rectifier type constant-voltage power sources offer instant arc starting and recovery, and results are much more uniform. Experience on all types of work indicates that this process greatly improves welding, speeds production and cuts rejections.

Similar advantages are found in Mig (metal inert-gas) welding. The instant response of the power source eliminates stubbing and burn-back in most applications.

The advantages enumerated apply to both semiautomatic and automatic processes. In addition, considerable improvement is made in hardfacing and stud welding with the rectifier constant-voltage power sources.

Although this power source demonstrated its super-



CABINET interior showing characteristic controls at upper left.

nozzle, is greatly minimized.

The advantages of conventional m-g sets as compared to rectifiers and transformers are seen in the CV m-g set. Change of primary voltage, for example, becomes important to shops and plants that have much electrical machinery in operation. Especially when their welding operations might be affected by intermittent or cyclic use of machinery.

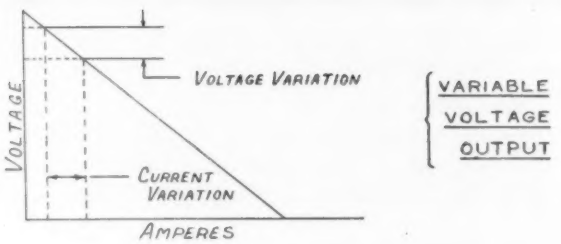
Tests have shown that a variation of 10% in primary voltage affects CV m-g output by less than 1%. The same voltage variation has caused 20-30% changes in outputs of rectifier type welding machines.

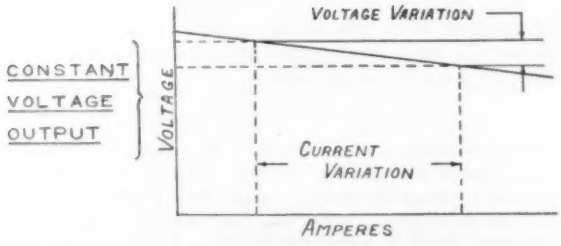
Overloading

Most welding machines are designed for a certain amount of overload as a safety factor. Duration of this overload is important.

Constant-voltage motor-generators, being rotating mechanisms with a large mass of metal, can be overloaded for a longer period than a rectifier. Naturally, the goal

THIS weldor is using constant voltage as his power source while he butt welds plates. Overloading is less menacing with CV, the author states.





current can deposit a uniformly thick bead across the weld width despite oscillation. A constant-potential power source tends to extinguish an arc as it is lengthened.

MG Sets

Motor-generators greatly assist in cold starts—the design of an m-g set allows output to be turned on or off by making or breaking its shunt field. This eliminates large contactors to break welding current and necessitates a fraction of a second to build up to full current when the field switch is closed. The central exciter is given an opportunity to operate during this momentary period, and current builds up smoothly for excellent starting.

Variations in input line voltage are not reflected in m-g sets. Because d-c m-g sets are rotating machinery driven by induction motors, sudden input voltage changes are unnoticeable at the arc. Transformer-rectifiers, however, magnify variations. This can be very important on critical applications, such as welding light plate where a surge in welding current may burn through, or when

iority over other methods, we found virtual removal of voltage drop between open circuit and loaded circuit did not provide the "cushion" effect desirable for low-current-density welding.

Disadvantage Overcome

But when arc characteristic controls were added, voltage drop could be obtained to gain better welding performances. With arc characteristic controls, inert-arc welding of light-gage metals with small electrodes was greatly simplified, particularly on aluminum, stainless and non-ferrous alloys. Tests indicated the process also worked well on submerged-arc welding.

Arc characteristics are controlled by a tapped phase-shifting device placed between auto-transformer and step-down transformer.

On one 300-amp model, a five-position rotary switch controls arc characteristics. The first position bypasses controls and the machine acts as a standard constant-voltage unit. Other positions allow progressively greater

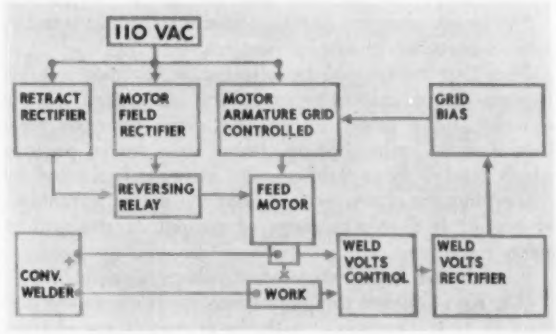


DIAGRAM illustrating the control system used on constant voltage rectifier systems. With characteristic controls, the weldor is able to adjust the power source to fit the work he has at hand. The author claims many advantages for this system.

of welding is *not* to overload the machine, but it does happen for one reason or another. And because the thermal capacity of a motor-generator is greater than a rectifier, safety devices designed for overload protection are less critical and perform well under adverse welding conditions.

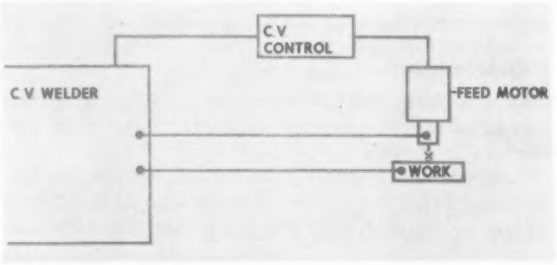
The volt-amp characteristic curve on a CV m-g set can be changed to meet requirements on any particular weldment. For instance, it may be more desirable to have a slightly drooping volt-amp characteristic than an exact constant-voltage characteristic.

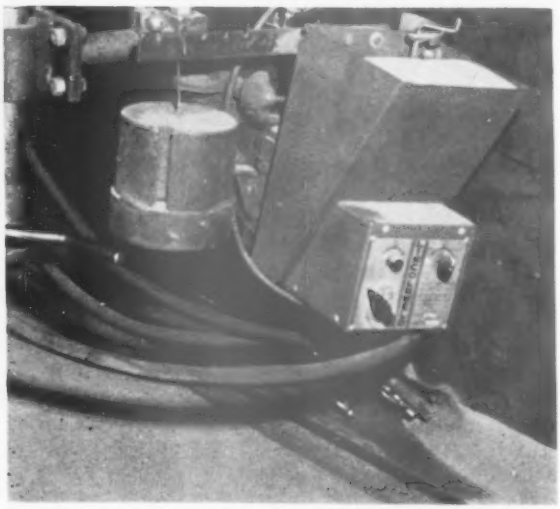
Various characteristics can be obtained by shifting brushholders on the motor-generator. Voltage drop in long welding cables can be compensated by again shifting the brushholders: voltage at the arc can thus be maintained.

Through these means, automatic welding processes need not require more than one type of power source.

Most CV welding machines are rated at 100% duty cycle, usually at 40 volts. Besides electricity, the CV motor-generator can be powered by gasoline. Power in this case is supplied from the exciter end of the generator, or by means of an additional generator. Such portable, self-sustaining units will be in demand in the future as more in-the-field uses are found for automatic welding.

Totaling the advantages of constant-voltage motor-generators, we find that its simplicity and longevity permit large and small industries to tool for automatic welding at the least possible cost.





HERE a submerged-arc welder is in action. But which is the better power source for this work, constant-voltage, variable voltage or constant voltage with rectifiers? Each of our authors argues for his point of view. The final decision, however, rests with you.

voltage drops—the operator can "tune in" to suit the job.

On larger models, operation is similar, but characteristic changes are made by jumpers.

Now that voltage can be adjusted, it becomes possible to keep arcs in craters by smoothing out depositions. As a result, more metal can be laid down on each pass. Round-about seam welding, heavy pass welds, or jobs which require large fluid puddles are also facilitated by controlling arc characteristics. But the major advantage, of course, is a greater range of current density with a given electrode.

What is the future of constant-voltage welding?

It is by no means dim, since new applications are discovered daily—especially with the advent of arc characteristic control, which may even be put to use in manual welding.

Equipment is improved as new rectifiers are developed. Accelerated aircraft and guided missile research has led to new and better selenium, germanium and silicon rectifiers.

X-ray quality is desired and a current drop might mean incomplete penetration.

Versatility Seen

All characteristics discussed in this article combine to form an extremely versatile power source for submerged-arc welding. Other power sources may have *some* of these advantages, but d-c variable-voltage m-g sets gather *all* into one unit.

Many of these units frequently have open-circuit voltage control. With this feature, a flatter characteristic is gained for special jobs that otherwise would require a constant-potential power source.

Current Output Of Rectifier Welders Compared To Motor-Generator Welders

Each unit adjusted for rated output at rated input voltage

	Percent Current Output At 90% Input Voltage	Percent Current Output At 110% Input Voltage
Rectifier A	77	130
Rectifier B	77	130
Rectifier C	75	138
Motor-Generator	99	101

WELDORS using protective garments and devices like these never have to learn about injurious metal fumes the hard way.

welding "hazards":

Our modern-day mythology

By T. B. Jefferson

SHORTLY AFTER the first weldor struck an arc, someone began complaining about welding fumes and several bystanders said their eyes felt as though there was sand in them.

The "sandy" feeling has been eliminated as shop workers and onlookers learned they had "flashed eyes"—a painful but harmless burn from arc rays which can be avoided with protective eye coverings.

Respiratory complaints, however, still create an industrial problem. The introduction of every new welding process or electrode type brings a rash of rumors concerning "health hazards" it creates.

It is difficult, if not impossible, to meet the weldor whose health has been ruined by new processes or electrodes. It is unbelievably easy, however, to talk to numerous persons who have "heard about" some weldor that contracted "a disease worse than tuberculosis."

Some members of this large and seemingly well-informed group have even "talked with a fellow that saw a weldor on his deathbed." The fabled and unfortunate weldor, it seems, was laid low by "X" electrode . . . or "Y" welding process . . . or "Z" flux.

This tale is readily modified to fit every new welding product on the market—to say nothing of the story-teller's particular dislikes.

Latest in the long list of welding complaints are those which heralded the introduction of Mig (metal inert-gas) and Tig (tungsten inert-gas) welding processes, and low-hydrogen electrodes.

Why Fear Them?

In some shops, where the *truth* about welding safety has never been disseminated, some weldors change color at the mere mention of low-hydrogen electrodes. They feel that some poisonous ingredient must have been added to the coating to produce such an electrode.

Manufacturers, of course, know this is not the case. The coating of a low-hydrogen electrode varies only slightly from that on a conventional type. There is, however, a difference in manufacture: the low-hydrogen coating is baked dry, and must be kept dry, to give it special characteristics.

When the conversation broaches Mig or Tig welding, there is sure to be an off-the-cuff expert nearby who will gladly brief you on the harmful effects likely to occur when breathing helium and argon. He is, of course, speaking about dangers that do not exist, for the experienced weldor that studies inert-gas-shielded processes before using them is in no greater danger than the equally well-informed woodsman who switches from an axe to a cross-cut saw.

And when it comes to welding with a CO_2 shield, the sidewalk toxicologists have gone so far as to suggest that "there are easier ways to commit suicide." Studies indicate, however, that a cigarette smoker inhales more of the obnoxious carbon dioxide and carbon monoxide fumes than does the weldor.

Pursuing the Facts

Eminent medical authorities have for years conducted a campaign of research to determine the credibility of literally thousands of health complaints laid on welding's doorstep.

The facts they unearthed probably won't surprise the observant weldor—he already knows that many procedures he follows, and the protective garments and devices he uses, are based on medical findings.

But other weldors, engineers and technicians are due for a shock simply because they have accepted unfounded charges against welding in lieu of facts.

With the proof to back their contentions, here's what medical experts say:

(*1*) Welding fumes do not cause pneumonia;

(*2*) Welding fumes will not cause tuberculosis;

(*3*) Welding fumes do not result in silicosis (a lung disease caused by inhalation of silicate or quartz dust);

(*4*) Welding fumes have no connection with stomach ulcers;

(*5*) Toxic gases are not produced by electrode coatings;

(6) Lead poisoning is the only chronic ailment that could be caused by welding fumes; other illnesses attributable to fumes dissipate quickly and have no cumulative effect.

(7) Arc weldor's siderosis (a condition caused by inhalation of iron particles) is not an occupational hazard. Although detected occasionally in weldors working continuously at their trade for more than six years, it has been pronounced *benign* in every instance.

On the Debit Side

These seven statements effectively rebut the principal arguments concerning welding's so-called health hazards. But in stating that welding fumes do not cause pneumonia, tuberculosis, ulcers or other very serious illnesses, we are not overlooking the fact that these same fumes *can* lead to illnesses of a lesser degree *when certain simple precautions are not observed.*

A variety of gases—plus some finely-divided metallic particles—constitute the fumes which arise from a welding arc. Principal gases normally represented include carbon dioxide, ozone, carbon monoxide, some nitrogen oxides and water vapor.

Of this group, only nitrogen oxides are present in a quantity which creates a potential hazard. Though ordinarily inert, nitrogen will combine with oxygen at high temperatures to form nitric oxide, a slightly toxic gas.

But it is only when oxidation has transformed nitric oxide into *nitrogen dioxide* that a really serious hazard exists. NO_2 has been held responsible for vertigo, dilation of arteries, severe inflammation of lungs and upper respiratory tract, pulmonary edema (*weldor's pneumonia*)—and even death.

Evidence tracing pulmonary edema directly to nitrous gases is as rare as the disease itself. But because these insidious gases can and will cause the other discomforting and painful symptoms noted above, steps should be taken to control and prevent their formation.

Fume Comparison

We have now counted the gases which will normally arise in the fumes from almost every welding arc. But are there other fume constituents and, if so, what are they?

The answer to the first part of this question is *yes.* Part two, however, has to be answered more than once, for different metals emit distinct fumes when heated to welding temperatures.

All stainless steels contain chromium. This is metallurgically fortunate—but rumor-wise, the chromium alloying ingredient has proved troublesome.

A toxicologist reporting on industrial hazards of metals used in the aviation industry found that chromium in the solid state had no "toxicologic importance." And although he suspected that weldors inhaling the gaseous metal might be subjected to "systemic chromium poisoning", he was unable to draw a clear-cut case against the alloy.

Symptoms of chromium poisoning—chest pain, eye irritations and chronic cough—are identical to those arising from the inhalation of nitrous fumes, ozone, fluoride fumes and several others.

Another research team took stainless steel electrodes into their laboratory to investigate charges of high calcium fluoride concentrations in the electrode coatings.

WITHOUT local exhaust, fumes from this arc may eventually irritate the weldor's eyes or respiratory tract. These fumes are also a nuisance to other plant personnel.

As part of the test series to which these electrodes were subjected, many of them were burned in a gas cabinet. No trace of the hydrofluoric acid which could theoretically be evolved from the electrode coating was found!

The authorities, in reporting on their stainless electrode tests, were forced to state only that, "it is believed that where the weldor works in dense concentrations of this type of welding fumes with inadequate ventilation, there may develop upper respiratory tract and conjunctival (*eye*) irritation."

With proper ventilation, however, there is no more of a fume hazard when welding stainless than there is in welding mild steel.

Aluminum and Magnesium

The same medical authority on hazards of aviation metals who was unable to blame chromium for causing certain common symptoms does not hesitate to give aluminum and its alloys a clean bill of health. But he warns that fluorine-compounded fluxes used to remove aluminum oxide prior to welding may possibly be dangerous.

Some fluorides are poisonous and highly soluble in the blood stream; other fluorine compounds, however, are not poisonous and are almost insoluble. It must not be assumed, therefore, that an aluminum flux is inherently dangerous.

With the growing use of the inert-gas-shielded welding processes, fluxes actually have ceased to be a major topic of conversation.

Welding of magnesium, unlike aluminum, may constitute a possible health hazard. *Magnesium fume fever* is the term which has been used to describe occasional reactions reportedly caused by exposure to molten magnesium.

There is a scarcity of medical literature treating this condition, however—apparently because so few cases have been reported.

A 24-hour illness that the welding industry has termed *metal fume fever* is also known variously as zinc fume fever, spelter's shakes, brass chills, and by many other names. This fever causes such symptoms as severe chills, fever up to 103°F., heavy perspiration, respiratory irri-

WITH an exhaust tube on the work bench, air around this welding arc is remarkably free of fumes. Fresh air intakes should supplant impure air being removed.

tation, throat dryness accompanied by a dry cough, nausea, vomiting and headache.

Most common cause cited for metal fume fever is the inhalation of zinc oxide particles. However, it can occur just as easily during the welding of brass or other zinc-bearing alloys *if the weldor is not properly protected.*

Metal fume fever is accompanied by leucocytosis, or increase in white blood corpuscles—a factor which incidentally prevents immediate recurrence of the illness. There are no after-effects.

The only effective method of preventing the discomforts of metal fume fever is through plant ventilation and by individual weldor use of respirators. The fever has yet to occur in areas where zinc oxide concentrations are kept below 15 mg per cubic meter of air.

Metal fume fever is representative of an acute illness; the poison inhaled in lead fumes, however, results in chronic illness: one that extends over a long period and may never be successfully cured.

Lead is an accumulative poison. It is removed from the body very slowly once it has entered tissues. Exposure even to small amounts of lead daily can be extremely dangerous.

Symptoms of chronic lead poisoning are colic, obstinate constipation, intense headache, loss of appetite, thirst, bad breath and general loss of weight. The sufferer may have a paralysis of the wrist and his eyes may also be affected.

Fortunately, lead is not a material commonly encountered by weldors. Welding applications on this metal normally occur only in the manufacture of lead-lined tanks, lead piping, and pipe fittings, in the manufacture or repair of storge batteries, and in X-ray or atomic power installations.

Almost as Dangerous

The fumes arising from cadmium as it is welded or flame-cut can be almost as dangerous as those from lead. This fairly popular plating material must never be heated to high temperatures by a weldor working without an air-line or filter-type respirator.

The difference in behavior of zinc- and cadmium-plated materials when heated with an oxyacetylene flame should be remembered.

According to tests at the research laboratory of Linde Co., zinc on galvanized sheet appears to volatilize as oxide almost simultaneously with melting. Dense white fumes are emitted, and they precipitate heavily on adjacent plate. It is extremely difficult to melt zinc without this heavy fuming.

In contrast to zinc's behavior, cadmium definitely melts before it volatilizes. Immediately following flame application to cadmium plate, the material agglomerates in molten droplets, then evaporates and oxidizes.

Priceless Protection

These are the hazards of welding. But don't forget that "hazards" remain simply a *potential* factor until *carelessness* brings them to life. It's up to the weldor, his supervisor, and all of top management to see that carelessness ceases to plague U. S. industry generally—and the welding field in particular.

It isn't the weldors who enjoy the benefits of proper fume exhaustion that lend strength to rumors of "incurable welding illnesses." These men lead a virtually trouble-free existence insofar as fumes are concerned because impurities are removed from air they breathe.

The variety of equipment now available to do an adequate cleansing job on the air surrounding a welding arc is sufficient for any individual or plant need. But just where should such equipment be placed, and in what volume should it replace impure air with "breathable" air?

What is Adequate?

Not all health authorities are in agreement on what constitutes adequate ventilation. The Public Health Service specifies *one complete air change every one to four minutes* as a guide for all locations.

Another recommendation by an eminent research team noted that open shops may not need local exhausts at weldors' benches, but that where production work is being handled, individual fume-removal ducts are desirable.

As a guide covering the latter type of operation, the researchers recommend that exhaust hoods be placed within 8 in. of the work, and that they draw about 200 cfm of air per weldor. If general ventilation is to be used, the team recommends that at least 400 cfm of air be withdrawn.

It is the opinion of still another medical authority that all spaces of less than 5,000 cu ft cannot safely be ventilated in a natural manner (*i.e.*, in tanks or vats). He also believes that all local exhausts should maintain an air velocity at the point of welding of 100 lineal ft per minute *away* from the weldor's breathing zone.

Providing Respirators

Coupled with recommendations for local and general air exhaustion is another item of good (and sometimes *mandatory*) advice: wear a respirator or a supplied-air mask or helmet wherever doubt exists concerning degree of protection afforded by other types of ventilation.

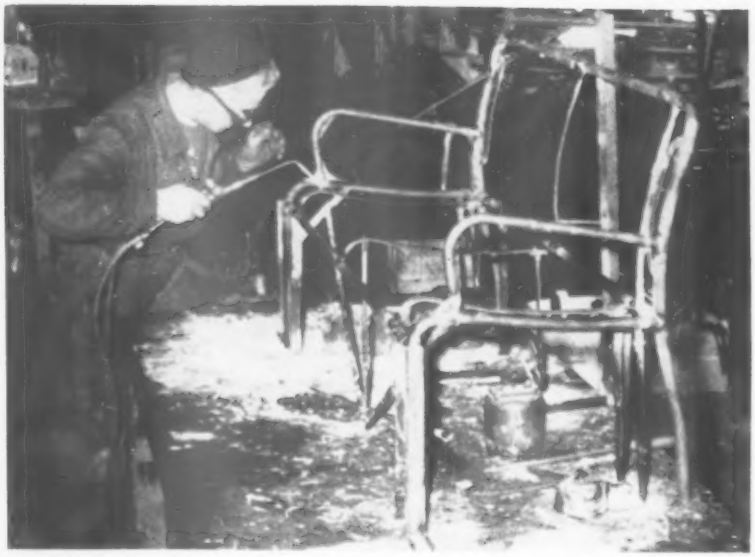
The need for such special weldor protection arises most commonly in areas where lead, zinc or cadmium are used as an alloy or a plating. The supplied-air helmet, of course, affords ideal protection.

But whatever ventilation equipment may be installed in your plant, remember that it is worthless unless its constant use is enforced.

First of two articles . . .

Brazing for greater productivity

*By G. M. A. Blanc and Rene D. Wasserman**



STEEL furniture manufacture is an industry owing its great expansion almost entirely to brazing, say the authors, who will discuss items like the bench above in next month's issue.

COST PRICE of a brazed assembly depends essentially on the cost of filler metal, of manpower required, and of gas and oxygen consumed.

Unit price of filler metals ordinarily used in manufacturing is variable. Silver solders are more costly than copper-zinc alloys, and the price differential is more pronounced as silver content increases.

(This rule is tending to lose its absolute character. In fact, modern metallurgy is acquainted with alloys containing *no* silver. These alloys contain such qualities as high tensile strength, and high corrosion, heat and wear resistance, that justify a price level comparable to that of high-silver alloys. For example, a nickel-chrome-boron-manganese alloy which bonds at about 1,652 F displays excellent resistance to corrosion and wear. Even in the case of common types of filler metals, addition of such elements as titanium, nickel or phosphorus, or the use of special manufacturing processes, can impart special qualities and increase the cost.)

*Dr. Blanc is director of research and development for the Societe des Soudures Castolin, S. A., of Lausanne, Switzerland. Mr. Wasserman is president of Eutectic Welding Alloys Corp., Flushing, N. Y. This article is based on a paper presented before a meeting of the International Welding Institute; Dr. Blanc heads the Institute's brazing committee.

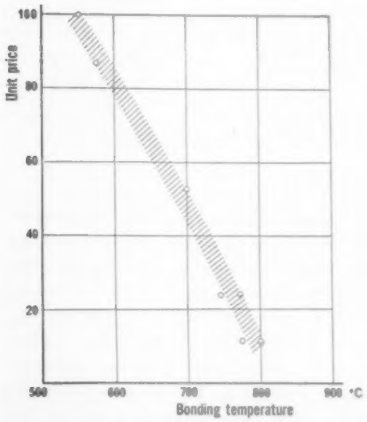


FIG. 1—Variation in unit price of various filler metals, depending on bonding temperature.

Cost Increase

Apart from such cases, however, cost price of a copper-zinc-silver filler metal increases regularly, and in more or less linear proportion, to its silver content. Since a similar relationship exists between silver content and fusion temperature, at least as far as usual silver content employed in industrial brazing is concerned, it is possible to trace a graph of price variation as a function of temperature.

Instead of a line, a price-temperature zone *(Fig. 1)* has been traced for a series of well known copper-zinc-silver filler metals. To approach more closely conditions encountered in practice, we have indicated bonding temperature of various filler metals instead of their fusion temperatures. The ordinate shows unit prices —the price of the alloy with lowest bonding temperature being 100.

Since, in certain kinds of work, tensile strength requirements may affect filler metal choice, the relationship between bonding temperature and tensile strength has also been established *(Fig. 2)*.

Melting speed of filler metal, together with its unit price, is a determining factor in the cost of a brazed assembly, since the number of man hours required for the brazing operation is dependent on it. Melting speed

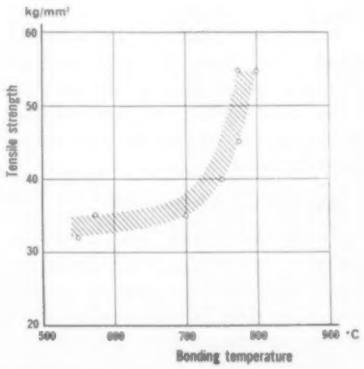


FIG. 2—Variation in tensile strength of various filler metals, depending on bonding temperature.

Joint design is important in silver brazing

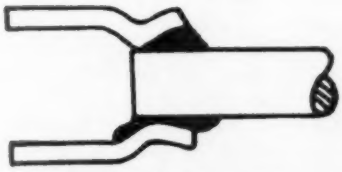
These designs are not recommended

Poor bond strength — no bond between pieces

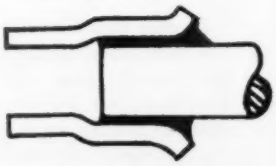
Clearance too great for capillary attraction

Bond area proportional only to thickness of metal

Bond area too small



Careless fitting — prevents capillary attraction

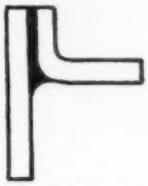


Unnecessary flare wastes filler material

Use these recommended designs

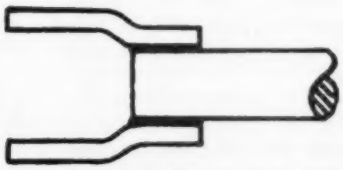
Good bond area. Also allows use of preplaced inserts

Provides good bond area

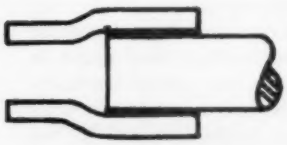


Flange provides greater strength

Bond area increased with flange



Uniform clearance helps proper flowing of filler metal by capillary attraction



Minimum clearance gives best results

—Courtesy Linde Co.

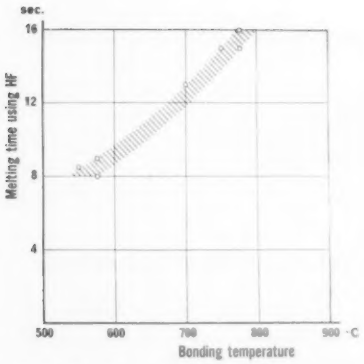


FIG. 3—Variation in melting time for various filler metals, depending on bonding temperature. Heat source: HF generator.

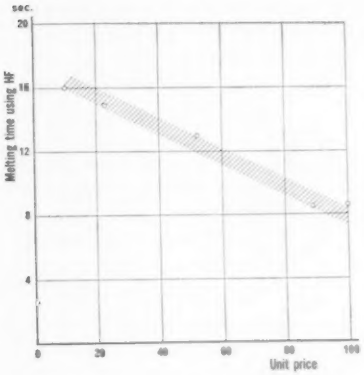


FIG. 4—Variation in melting time for various filler metals, depending on unit price. Heat source: HF generator.

usually increases as melting point drops.

In determining this relationship, a measurement *(Fig. 3 & 4)* was made of the time needed to make a given sample assembly with the various filler metals described above. A high-frequency generator was used as a heat source.

Oven Heating

To verify the price-melting time relationship obtained with HF heating, an oven was maintained at a constant 1,778 F. Test results *(Fig. 5)*, in both cases, showed a striking analogy in the variation of melting time as a function of price.

With an oxyacetylene torch, shape of the price-melting time graph is still the same, but results are influenced by experiment conditions: position of the torch, dexterity of the weldor, flame setting, etc. For example, the graph in Fig. 6, obtained with a normal flame, shows the effect of acetylene output on melting time for a given filler metal.

Obviously, melting time is cut approximately in half by tripling acetylene output. This graph illustrates the importance of correct flame setting for utmost economy in torch operation.

Following is a specific example of the influence of melting speed and filler metal price on total assembly cost.

Filler Plus Manpower

Overlooking the cost of gas and oxygen used, cost of a brazed assembly is equal to the price of filler metal plus cost of manpower. For 1,000 assemblies, this may be expressed if:

"c" is total cost.

"q" is quantity of filler metal used in kgs.

"p" is price per kg of filler metal used.

"t" is melting time in seconds.

"s" is manpower cost per hour *(including general manufacturing costs)*.

We thus have: cp x q plus t x s ÷3600.

To impart a general character to the relationships, filler metal and manpower cost are expressed with respect to the value of the alloy having lowest bonding temperature. This value is equal to 100. Hourly manpower cost, which amounts to about 1/20th of the alloy price used for reference, is represented by the figure 5=100÷20.

By using the most expensive filler metal and the shortest melting time with an HF heat source, the following figures are obtained:

"p"=100
"q"=40 kg÷1000
"t"=8.5 x 1000
"s"=5

from which we get: c=4 plus 11.8=15.8

Apparently, the choice of cheaper filler metal would result in an increase in total cost, since the reduction in filler metal cost would be smaller than the increase in manpower cost.

Repeating the calculation in respect to the cheapest filler metal, quantity used remains the same, but melting time is increased. We now have:

"p"=12
"q"=40 kg÷1000
"t"=16 in. x 1000
"s"=5

from which: C=1.48+22.30=22.78

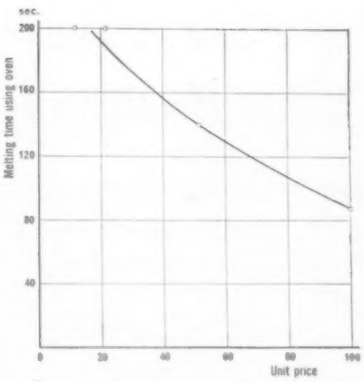


FIG. 5—Variation in melting time for various filler metals, depending on unit price. Heat source: oven.

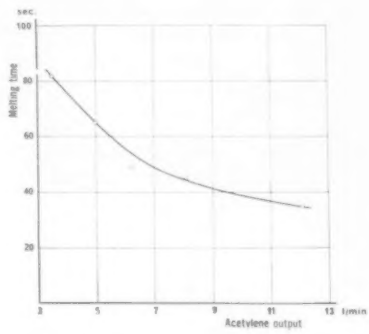


FIG. 6—Variation in melting time for various filler metals, depending on acetylene output. Heat source: oxyacetylene torch.

Total cost is therefore increased about 44% by using the cheapest filler metal. Actually, the increase is much greater, since machining time must also be considered. With more expensive filler metal, machining time will be less—or non-existent.

Consumption of gas and oxygen is also reduced with the more expensive alloy. And generally, less filler metal is required per joint.

Such cases are frequently encountered in practice. They show that use of high-quality filler metal often permits total cost of an assembly to be reduced despite a higher alloy unit price.

* * *

In next month's issue of WELDING ENGINEER, *descriptions of some practical brazing jobs will be given to underline the importance attached today to brazing in production work. The examples will also indicate the extent to which brazing has become an indispensable means of achieving increased productivity.*

ATTRACTIVE, yes. Safe, no. Goggles were designed to protect the eyes from the glare of oxyacetylene torches, not as a decoration.

The role of safety in the welding industry cannot be overpracticed. Check yourself against the safety rules listed here.

C_2H_2—a servant, not a menace

By L. A. Morehead
Technical Service Supervisor
*National Cylinder Gas Co.**

A CHARACTERISTIC OF C_2H_2, that necessary gas called "acetylene", is that under certain conditions, it decomposes with explosive force. This can create an unhappy situation for anyone unfortunate enough to be standing beside a cylinder that is "decomposing explosively."

Acetylene is a colorless gas slightly lighter than air. Its ignition temperature varies according to composition, pressure, water vapor content and initial temperature. For example, a mixture containing 30% acetylene by volume with air at atmospheric pressure ignites at 581 F.

Because acetylene is unstable it must be handled more cautiously than many other industrial gases. Increased temperature and pressures become dangerous and are the main reasons why no attempt should be made to transfer acetylene from one cylinder to another, or to compress the gas.

Pressure Limits

Pressures exceeding 15 psig in pipelines and other systems from generators or cylinders should be prohibited. The question arising at this point probably is, "If this is the case, why is it safe to use 250 psig when the gas is in cylinders?" The answer, of course, is that cylinders —even when gas is withdrawn—are not empty.

A 'filler' remains inside the cylinder to insure against the existence of areas which might collect 'free' acetylene. Minute cellular spaces in the filler, treated with acetone, dissolve any remaining gas. This permits acetylene to be held in containers—at moderate pressures—without danger of explosion.

The Interstate Commerce Commission allows cylinders protected in this way to be compressed at 250 psi at 70 F. A variation of 2.5 psi is permitted with each degree of rise or fall in temperature.

In addition to these precautions, the ICC states that all cylinders must meet specifications as set forth in ICC-8 or ICC-8AL. Canada has similar laws listed in BTC-8, CRC-8, BTC-8AL, and CRC-8AL.

These laws specify that cylinders pass hydrostatic pressure tests; fillers have a definite range of porosity; a specified amount of acetone solvent be used; adequate safety measures be provided, and a certain type of steel be used in cylinder manufacture. The ICC has federal authority to enforce specifications.

Compression of acetylene into cylinders is a task which should be left for professionals; gas must be pumped into the cylinder for many hours and kept under a constant spray of cooling water.

Safety Devices

Manufacturers are naturally aware of dangers to acetylene cylinders. To prevent explosions from abnor-

*Based on a paper presented before a meeting of the International Acetylene Ass'n.

Safety has more appeal than recklessness

mally high temperatures such as those caused by fire, safety relief devices are installed on cylinders. The devices contain fusible metals which melt at about 212 F, the temperature of boiling water at atmospheric pressure.

Since valves are delicately tuned to control gas flow, the operator must be extremely cautious in handling them. Under no circumstances should he attempt to repair or alter valves or safety devices.

Further, an acetylene valve should never be opened more than 1½ turns. And, if leaks are suspected, investigations must be carried on with soapy water, not a flame. Special wrenches or keys are supplied by the cylinder manufacturers; these—and only these—should open cylinders. Wrenches and keys lying about the shop should never be used for this purpose.

Cylinders should be used and stored in an upright position. Falling cylinders can behave like bombs; therefore, it is wise to chain them into position. If cylinders must be moved a short distance or vertically, use a cradle, platform or boat. Electromagnets and slings are too risky for cylinder transportation. And never lift or carry a cylinder by the valve cap.

Oxygen Cylinders

Oxygen is added to acetylene to support and aid combustion rate. Anything which burns in air will flame even more vigorously in oxygen. Oil, for example, burns with explosive violence in pure oxygen, while in air its combustion point is quite high.

Oxygen is compressed into hollow seamless cylinders. Maximum pressure to which a cylinder should be filled at 70 F is known as "service pressure" and varies between 1,800 and 2,400 psi. In addition to the manufacturer's code mark and a serial number, oxygen cylinders also carry a specification number and service pressure as specified by the ICC. The cylinder is hydrostatically tested every five years for extra protection and the test date is stamped on the casing.

Because oxygen supports combustion so well; oil, grease, or combustible materials should never touch cylinders, valves, regulators, gages or fittings. Obviously, these materials must never be employed in lubricating cylinder parts or attachments.

There are definite preparatory steps which must be followed when working with oxygen cylinders. After the valve protection cap is removed, the valve—pointing away from the body—is opened very slightly to clear it of dust particles and dirt, then closed almost immediately.

The regulator is attached and its adjusting screw released before the cylinder valve is completely opened. The operator, still standing away from, and to one side of, the regulator, opens the valve slowly in order to equalize pressures.

As noted previously, only the proper wrench or key should be employed. If a valve is equipped with hand wheels, wrenches are never used. When such valves cannot be easily opened by hand, hammering with tools only tempts disaster: sticky valves are a supplier's problem and should be referred to him.

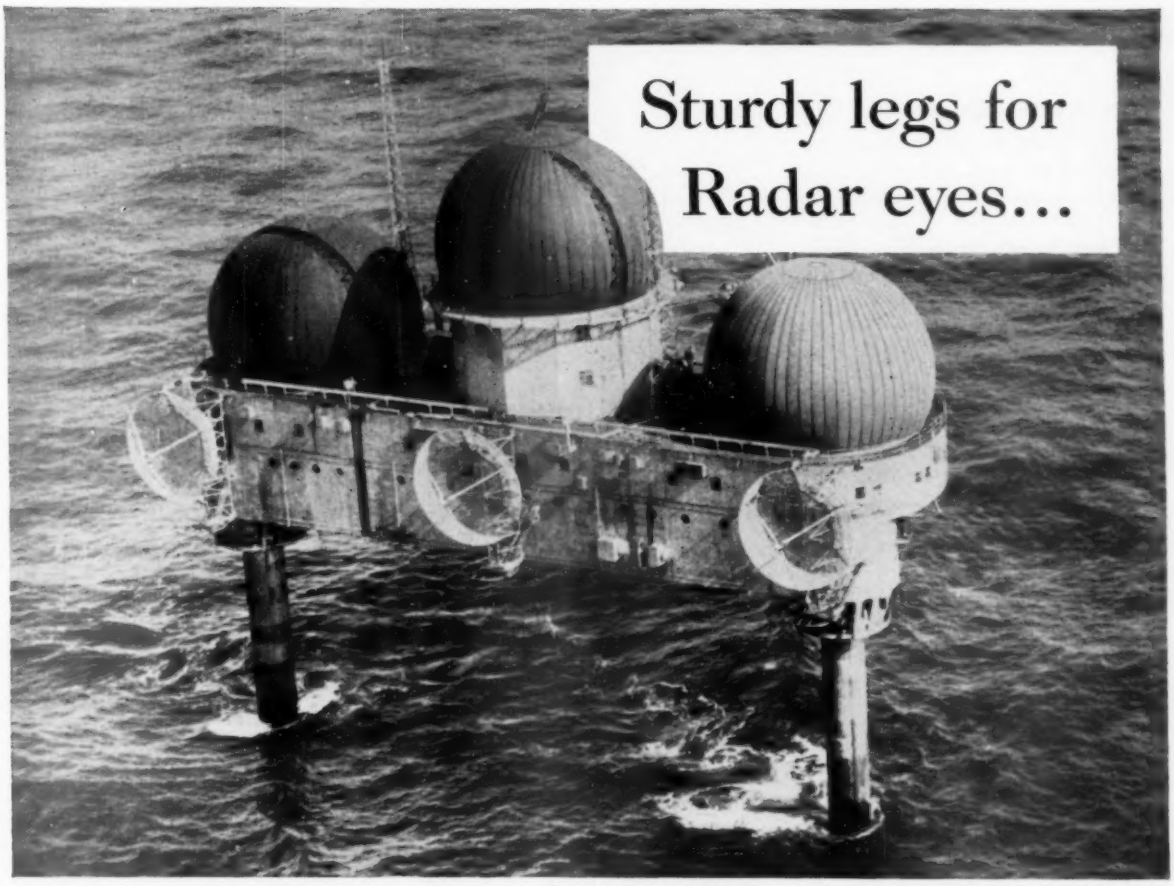
Never permit oxygen to enter a regulator suddenly; open the cylinder valve slowly. When the valve is fully opened, it should remain so while the cylinder is in use. As soon as work is completed, the valve must be closed. If a regulator is being removed from a cylinder, the operator should make sure that the cylinder valve is closed, and that all gas has been removed from the regulator.

Dangerous Practices

Odd as it may seem, slang can lead to trouble. Loose phrasing—referring to both oxygen and acetylene by the coverall term "gas"; labelling regulators "gages," and calling cylinders "tanks" or "bottles"—has caused much confusion.

For example, a careless misnomer has resulted in the substitution of compressed air for oxygen!

Another common shop practice—and a very dangerous one—is wiping the valve with the palm of the hand, a rag, or a glove. Slight traces of combustible material are enough to



One of America's offshore radar warning towers—Texas Tower III—built by Walsh Holyoke Division, Continental Copper and Steel Industries, Inc.

...with each seam checked on Kodak Industrial X-ray Film, Type AA

2700 tons of island rest on these 272-foot welded caissons. With giant seas and howling gales to stand against, every seam must be sound. Radiography provided the evidence of each weld's quality.

Each weld was radiographed using a 10 curie pill of cobalt 60. And because Kodak Industrial X-ray Film, Type AA, provides greatly increased film speed, exposure times could be moderate.

While giving speeds up to twice that of the former Kodak Type A Film, this new film retains the fine sensitivity characteristics which made Type A the most widely used x-ray film in industry.

Your x-ray dealer and the Kodak Technical Representative will gladly tell you how this new film can improve your radiographic operation and help you get more out of your present x-ray or gamma-ray equipment. It can pay you to get in touch with them.

Read what the new Kodak Industrial X-ray Film, Type AA, does for you:

- Reduces exposure time—speeds up routine examinations.
- Provides increased radiographic sensitivity through higher densities with established exposure and processing technics.
- Gives greater subject contrast, more detail and easier readability when established exposure times are used with reduced kilovoltage.
- Shortens processing cycle with existing exposure technics.
- Reduces the possibility of pressure desensitization under the usual shop conditions of use.

EASTMAN KODAK COMPANY
***X-ray Division*, Rochester 4, N. Y.**

Kodak
TRADE MARK

For welding, Kodak Industrial X-ray Film, Types AA, M, and K, are available in the new 70mm by 550 ft. package.

trigger an explosion. Steel wool is another wiper which should be on the forbidden list.

Other Safety Devices

Many safety installations are not recognized as such. A weldor may find what seems to be a clogged regulator screen and remove it, only to learn later he has junked a heat dissipating element. Only fully prepared maintenance personnel should repair cylinders. Slight savings cannot be made at the expense of injury, or worse.

Between regulator and torch, oxygen and acetylene in their respective hoses are not dangerous. But mix them before they enter the hoses and they present a threat. Both lines—one at a time—should be thoroughly purged before attempting to light the torch.

Never open both valves of an oxy-acetylene torch at one time unless the torch is lit. This rule will prevent many accidents.

Welding carts, besides supporting cylinders, offer a convenient surface on which to mount a box or bracket to hold the torch and coils of hose. These handy racks can be dangerous if valves are not completely shut. Acetylene may leak and keep a small flame burning at the torch tip.

If the torch is hung over the regulator, it may rest on the acetylene cylinder's safety plug. The fuse may melt, releasing acetylene which can be immediately sparked into an explosion by the flame. This does not always happen in a few seconds because more heat may be required over a period of hours—but the result is the same.

Remodeling and Conversion

Many firms seek to cut production costs by changing over equipment used with one gas to take another. They attempt the modification by making special inlets or using adapters. *This should not be done.*

It is true that many times a regulator *is* accepted as standard for another gas. Even so, adapters must be installed so that the two different size inlets will match.

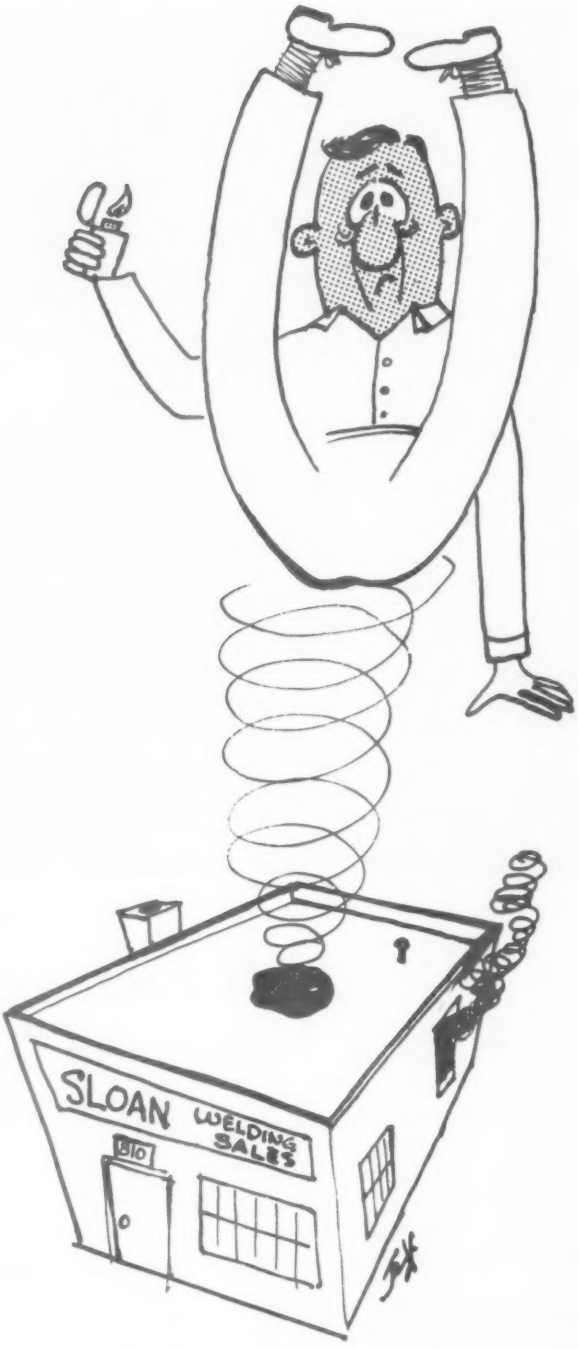
Also, regulators differ in internal design even though their external appearance may be identical. It becomes necessary, then, for installations to be made by a person well versed in necessary safety precautions. An amateur may install a regulator rated for 300-psi inlet pressure in a location where a 2,000-psi unit is required. Parts in the former regulator are almost sure to rupture.

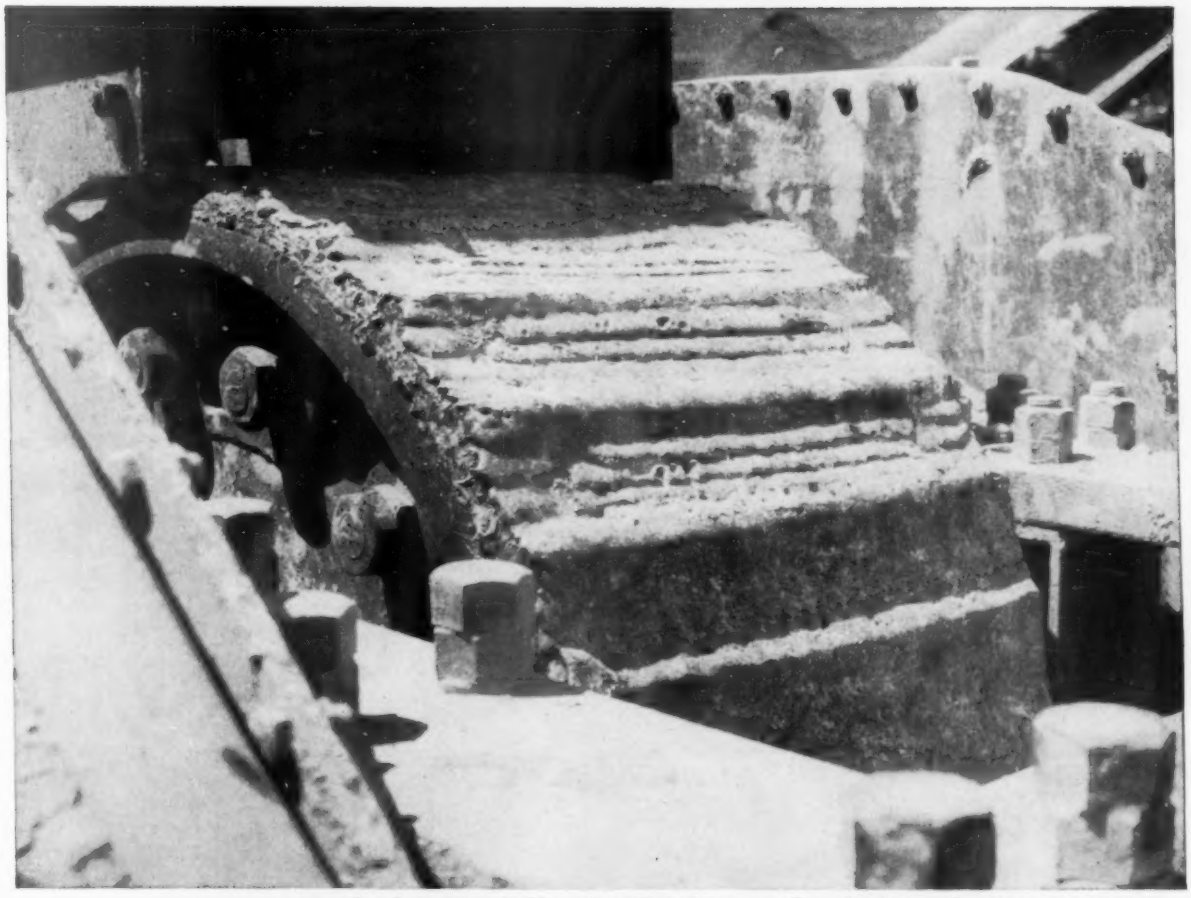
Copper tubing or fittings made of unalloyed copper should not be used with acetylene. A chemical reaction forms copper acetylide, an extremely volatile compound which detonates with only a slight shock.

On occasion, cylinders become balky. Many welding equipment distributors have their own repair shop, and can do the necessary work. If not, they can recommend reliable repairmen. When cylinder problems arise, always consult the distributor: his advice and equipment are safe and economical.

"Talk is cheap" is a common phrase. *Safety* talk *is* far less expensive than serious injury or death.

Never check acetylene leaks with a flame





Since their last major rebuilding, this 18" x 30" Pioneer roll crusher has produced 30,000 tons of aggregate. Twice-a-week touch-ups with Stoody 100 hold wear to a minimum.

STOODY SEMI-AUTOMATIC HARD-FACING helps maintain road schedule in HIGH SIERRAS

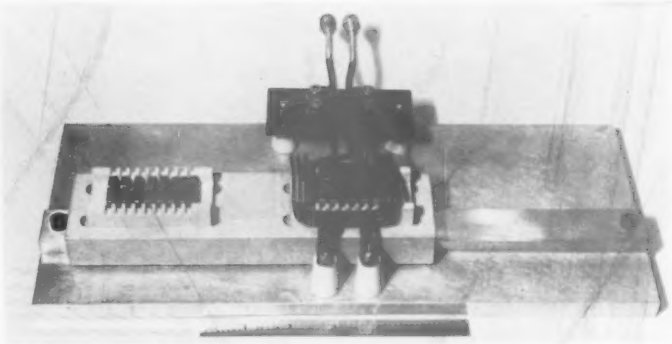
A new 16½ mile State Highway between Shaver Lake and Huntington Lake in the high Sierras was recently completed by Phoenix Construction Co. of Bakersfield, California. One interesting feature of the job was the preparation of aggregate which was supplied by portable crushers operating near the site. Material used was quarried blue granite. Primary reduction was effected by jaw crushers followed by a final roll crushing operation. 210,000 tons of aggregate were required, as well as production of sand from the same material. Crusher rolls consequently suffered considerable wear.

The crusher corrugations were completely rebuilt with Stoody Manganese, spacing about 3" peak-to-peak. These were overlaid with Stoody 100 applied with the semi-automatic welder. Wear was never permitted to reach the manganese shell thereafter. During shut-downs, corrugations were retouched with Stoody 100, as required, restoring full efficiency for the following shifts.

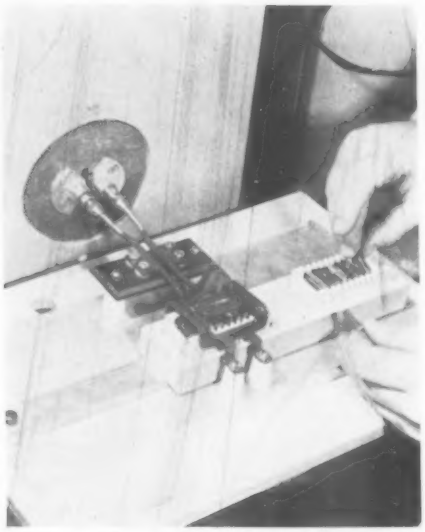
Facilitating maintenance work is this portable semi-automatic welding machine. Quickly hauled to the site, it is dismounted from the truck for use.

Hard-facing methods for most successfully maintaining all your wearing equipment are fully described in the Stoody Guidebook and folder covering semi-automatic procedures. Ask your Stoody dealer for a copy (see the "Yellow Pages" of your phone book) or write direct.

STOODY COMPANY
11941 East Slauson Avenue
Whittier, California



CERAMIC jigs mounted on fixture hold shunts for induction brazing. Note small size of the ceramics.



Courtesy Lepel HF Laboratories, Inc.

COPPER shunts being loaded for brazing while another group is processed.

High speed brazing with ceramic jigs

By Herbert Schwartz
General Manager
Technion Design and M|g. Co., Inc.
New York, N. Y.

DEMANDS OF COMPETITION have intensified the search for faster and less costly fabrication methods. High-speed brazing fills these requirements.

Even better than conventional torch brazing is the induction process. Being both rapid and accurate, it often boosts production 100-300%, a distinct lure for the fabricator who seeks to cut his costs.

Current induced through an electromagnetic field generates heat which tends to fuse metals within its area. This sets up severe strains on equipment used in the process, especially in jigs for automatic brazing.

Jig Requirements

In order to operate effectively under such conditions, jigs must be able to meet certain specifications.

(1) A jig must be a non-conductor with good dielectric strength and it must not interfere with the inductive field.

(2) It must resist flux penetration.

(3) It must not warp after repeated cycles nor oxidize at temperatures above 1,200 F.

(4) A jig must be able to withstand thermal shock and sudden cooling after brazing.

(5) It must not be "wet" by molten alloys.

(6) It must be hard and durable.

(7) It must be capable of fabrication into the complex shapes often necessary for automatic production.

Finding a material to fit all these qualifications is difficult. Many are ruled out immediately. Metals are conductors. Plastics give way under operating temperatures. Mineral-based insulators cannot be used because they often react with flux and cannot be fabricated to close tolerances. Tool steels now being used are costly and frequently become fouled.

Ceramic Jigs

Ceramics seem to be the answer. One of the many types available is a material, "Sur-Braze M120F", which fits all requirements listed above. It is an aluminum-silicate ceramic with a dielectric strength of 80 volts per mil in ¼-in. thicknesses. A thermal expansion of 1.5 x 10^{-6} in./in. deg F, and a compressive strength of 4,000 psi (after firing) enable it to withstand severe thermal shocks.

"M120-F" is non-oxidizing and holds its size after many cycles. It is technically vitreous, resisting fluxes, and machines easily before firing. After firing, its hardness is comparable to tool steel.

If close tolerances are required, the ceramic can be ground to 0.0001 in. Shapes vary up to 4 by 4 by 12 in., in addition to special precision-fabricated parts.

Applications

One firm, an electrical manufacturer, wished to convert brazing of pole copper shunts from a torch to an induction method. Copper, however, is a very good conductor and does not readily lend itself to induction heating.

By using ceramic jigs, the manufacturer can hold heat in the shunts to a degree necessary for induction brazing. Since ceramics do not "wet" because of alloy overflow, the firm avoids pieces welding themselves to the jig, a common problem with other work-holding devices. Further, the ceramic's high dielectric strength concentrates the inductive field on the shunt.

Because of these features, it is possible to braze the shunts automatically. Pieces are lined up in the jigs, which in turn are loaded into the base and slid under the induction unit. While one set is being brazed, another jig is loaded and prepared for the operation.

By utilizing this method of brazing, production was jumped from 300 to 950 pieces per hour, an increase of 316%.

Protection for Eyes

Pick Your Quality Protection!

(Both goggles fit over ALL Prescription Glasses)

AO 486 Flexible Mask Welding Goggle

A very, very comfortable goggle with its soft, smooth-against-the-face vinylite mask. Fits closely. Indirect ventilation louvers eliminate fogging. Black rim holder of flame-resistant plastic, adapted to accommodate our standard lens ring and regular 50 mm. round filter lenses and cover lenses. It's easy to remove and replace rings and lenses. Fitted with Noviweld filter lenses, shades 3, 4, 5, 6. (Available in Filterweld lenses on request.)

AO 489 Companion Chipper's Goggle

Equally comfortable as the "486" for fit. It's the same goggle except frame is transparent and ventilation is *direct* thru perforations instead of indirectly thru louvers. Also lenses, of course, are *clear* Super Armorplate.

Always insist on the AO Trademark on Lenses and Frames.

American Optical COMPANY
SAFETY PRODUCTS DIVISION

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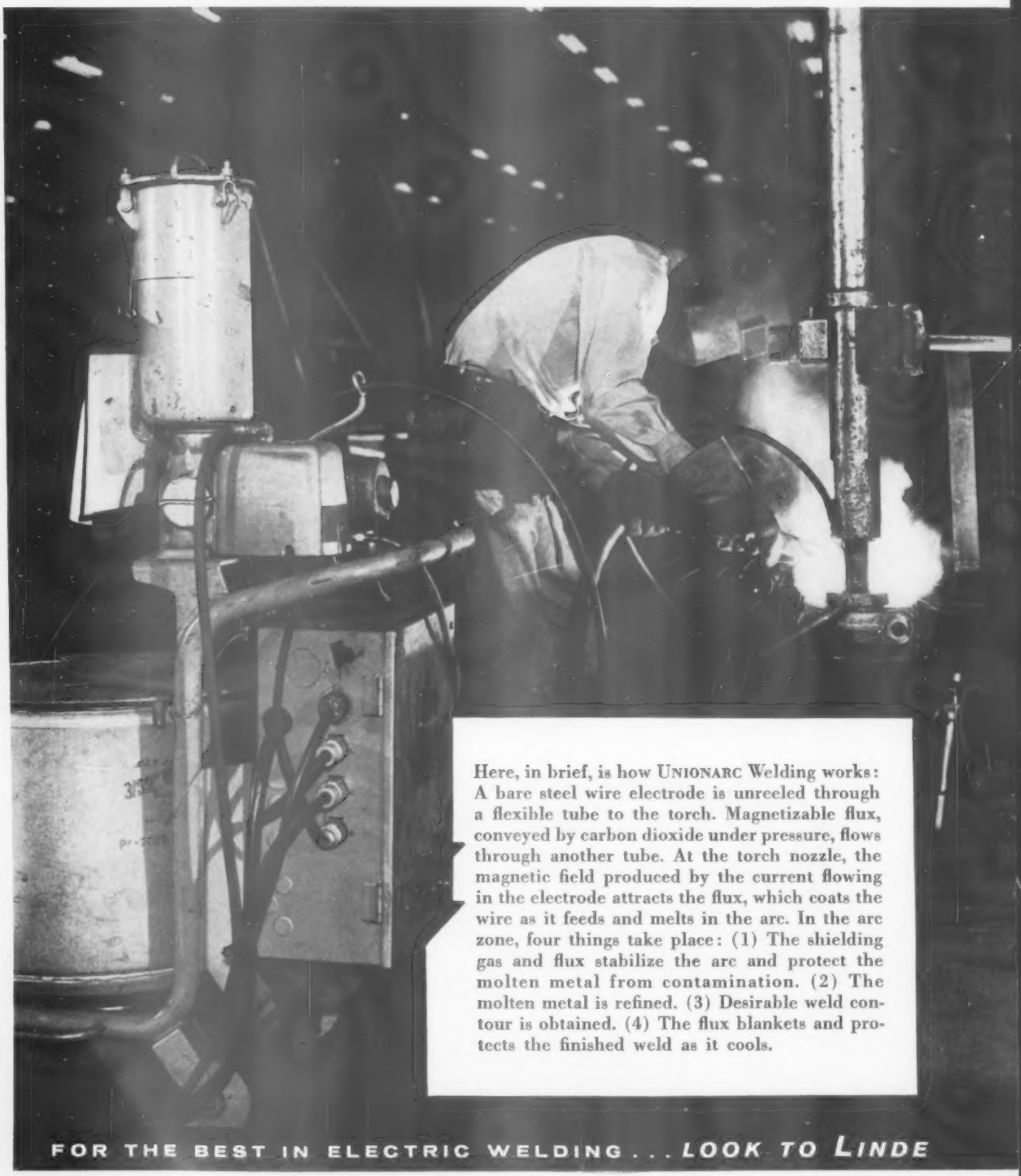
Now... LINDE offers you another UNIONARC Magnetic



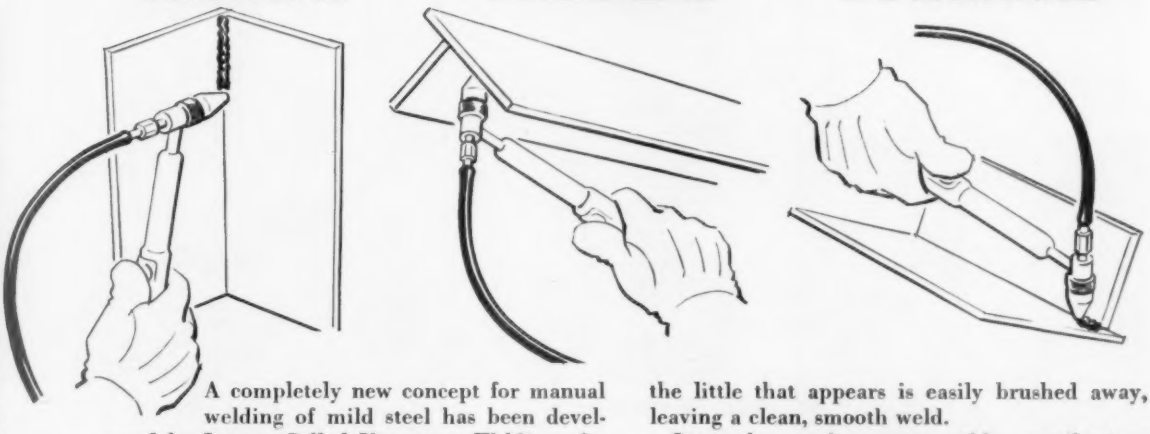
Here, in brief, is how UNIONARC Welding works: A bare steel wire electrode is unreeled through a flexible tube to the torch. Magnetizable flux, conveyed by carbon dioxide under pressure, flows through another tube. At the torch nozzle, the magnetic field produced by the current flowing in the electrode attracts the flux, which coats the wire as it feeds and melts in the arc. In the arc zone, four things take place: (1) The shielding gas and flux stabilize the arc and protect the molten metal from contamination. (2) The molten metal is refined. (3) Desirable weld contour is obtained. (4) The flux blankets and protects the finished weld as it cools.

FOR THE BEST IN ELECTRIC WELDING . . . *LOOK TO LINDE*

modern welding method—
Flux Gas Shielded Arc Welding

UNIONARC *is an entirely new method of welding steel in all manual positions...*

VERTICAL **OVERHEAD** **DOWNHAND**



A completely new concept for manual welding of mild steel has been developed by LINDE. Called UNIONARC Welding, the method uses a continuously-fed bare steel wire electrode, which is magnetically coated with flux and shielded by carbon dioxide. The torch can be easily handled in all welding positions—vertical, overhead, downhand. Manual welds can be made at higher speeds and at lower cost than with covered electrodes. UNIONARC Welding produces high-quality welds in steel, even when moderate amounts of rust, scale, and moisture are present.

Among the numerous advantages of UNIONARC Welding are these: Rate of operation is up to three times faster than with covered electrodes. There is no stopping to renew electrodes, since a single loading of wire can be fed smoothly and continuously for periods up to a week. Manual skill needed is no more than that required with covered electrodes. In vertical and overhead positions, the deposition rate in UNIONARC Welding is two to three times greater than with covered electrode methods; in downhand positions, up to twice as great. There is practically no spatter—the little that appears is easily brushed away, leaving a clean, smooth weld.

LINDE has made many notable contributions to welding. Among these are the introduction and development of submerged arc welding (UNIONMELT Welding), non-consumable electrode, inert gas shielded arc welding (HELIARC Welding), and the development of Sigma (shielded inert gas metal arc) welding. LINDE's newest method, UNIONARC Welding, is another *first*—a truly important contribution. Its simplicity and versatility make it unique. Its efficiency and economy have been proved in actual production work. Write *now* for details about UNIONARC Welding, or call the LINDE office nearest you.

LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y. Offices in other principal cities. *In Canada:* Linde Company, Division of Union Carbide Canada Limited.

The terms "LINDE," "HELIARC," "UNIONMELT," "UNIONARC," and "UNION CARBIDE" are trade marks of Union Carbide Corporation.

Linde
TRADE-MARK

UNION CARBIDE

In New York

Torches fell reluctant giants

WELDOR flame-cutting as part of operation to scrap New York subway generators before installation of new machinery.

OPERATOR, standing high above the floor, demonstrates ease of cutting through heavy steel.

SOME segments of steel weighed 45 tons when loaded and placed upon trucks after cutting job.

"TIME," they say, "is no respecter of persons." And neither is progress. Back in 1902, nine huge generators were installed in New York to power the city's subway system. But time passed and took its toll. The generators were no longer the last word—in 1957—as they were in 1902; the IRT decided they must be dismantled to make way for a more modern power installation.

The Eternal Flame

But demolishing a structure is not always as easy as erecting one . . . steel is stubborn and almost seems to resent losing its identity. So Lipsett, Inc., the firm in charge of leveling the generators, called on oxyacetylene torches to help them.

The firm attacked the 38-in.-thick plates with Air Reduction Co. heavy-duty oxyacetylene torches. An oxygen trailer with a portable control panel for pressure reduction and control served as supply and gas distributor for the job. A 1-in.-diameter hose from the control panel to a six-outlet header supplied six cutting operators.

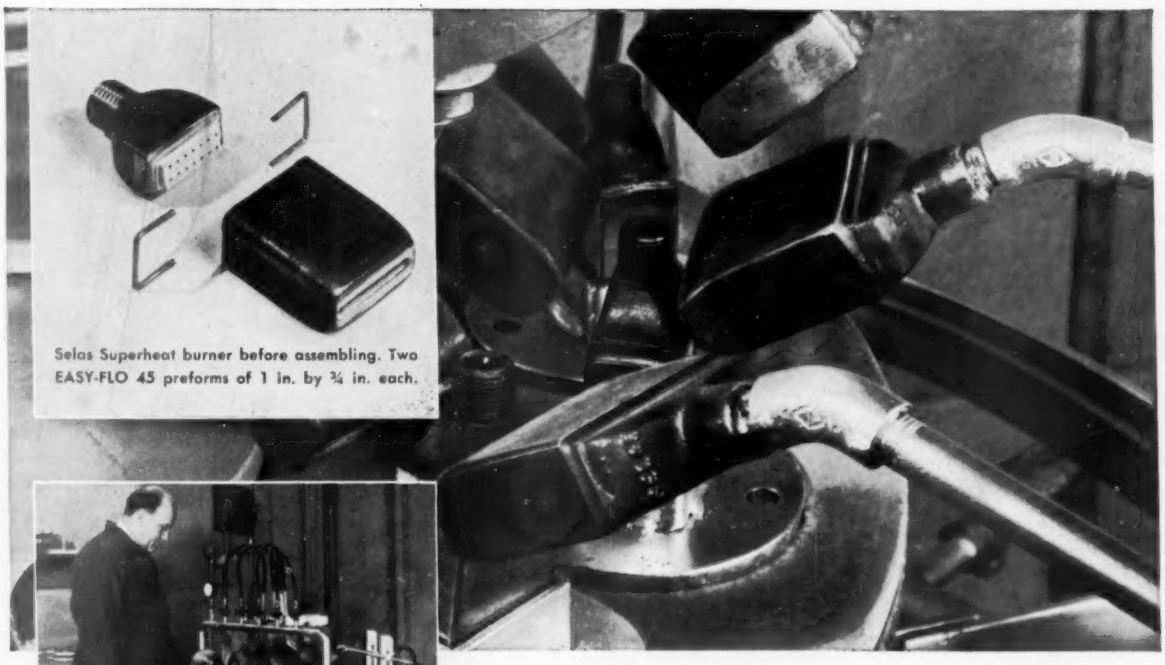
Acetylene Equipment

Acetylene requirements were filled by manifolding 12 acetylene cylinders, all protected by hydraulic flash arrester units. Acetylene was then transferred from the manifold to a six-outlet header, and to torches through a 1-in.-diameter hose.

Besides the 38-in. steel which had to be cut, flame-cutters sliced easily through built-up steel laminations, 24-in.-thick, with mica sheeting sandwiched between them.

Some of the steel sections cut free and hauled away on low-boy trailers weighed as much as 45 tons. This scrap will be salvaged for new steel as the way is cleared for better equipment.

Selas Superheat burner before assembling. Two EASY-FLO 45 preforms of 1 in. by ¾ in. each.



Operator shown placing assembled burners in Selas rotary gas-air equipment to start 75-second brazing cycle. Large illustration shows burners under heat.

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How Selas Corporation Goes "Full Cycle"... brazing the burners that are used in their brazing machines

If any part of a gas-fired heat processing machine gets more of a workout than the burners, we don't know what it is. It's at this point that high temperatures and heat transfer come to a "head" and if the burner is faulty then the machine is useless. Selas Corporation of America, Dresher, Pennsylvania, custom-builds a large variety of gas-air brazing machines for specific workpiece demands and for their rigid manufacturing requirements they find Handy & Harman silver alloy brazing the *strong* method for joining the metallic components of their superheat burners.

The reputation of Selas heat-processing equipment for precise heating temperatures, specific heat patterns, high heat transfer, speedy change-over and over-all versatility can be attributed in many respects to the burners, which are designed and joined to *bear the brunt* of the machine's work.

Each burner is brazed with two preformed clips of 1/16" Handy & Harman EASY-FLO 45. One machine operator assembles the Inconel burner head to its bronze base, places the preforms, applies the HANDY FLUX and loads the dial conveyor for the brazing cycle. The same operator unloads, cleans and brushes the brazed burners. Each assembly is under heat for 75 seconds and production rate is four per minute. The alloy cost? Three cents per burner. Simple, strong and low cost, we say. You might be able to say the same three things about joining your product. All that's necessary is to call Handy & Harman. We'll tell you everything you want to know about silver alloy brazing – what it is doing for thousands of other products and what it can do for yours.

FIRST, BULLETIN 20

This informative booklet will get you off to a good start on the values, techniques and economies of low-temperature silver brazing. A copy awaits your request.

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EVER increasing numbers of foundries are using Tig welding to repair castings imperfectly formed.

Another article in WE's series on . . .

Filler metals for joining

By Orville T. Barnett*

TWO SIGNIFICANT advances in welding aluminum and aluminum alloys have been achieved in recent years. One is widespread adoption of inert-gas-shielded arc welding (first Tig, then Mig) to eliminate messy flux cleaning associated with coated-electrode arc and gas welding. The other is development of new alloys designed for welding.

In the past, designers sorely missed high strength aluminum alloys that were forbidden where welded fabrication was involved—welding heat annealed base metal in the heat-affected zone and all high-strength advantages wilted away.

But now that aluminum welding is expanding by leaps and bounds, the weldable, high-strength alloys produced by ingenious metallurgists are providing designers with new freedom.

Filler Metal

For convenience, the two ruling filler metal specifications have been combined in Table I according to chemical requirements. The specification for *Aluminum and aluminum alloy metal arc-welding electrodes* issued by the AWS-ASTM (AWS Specification A5.4-43T; ASTM Specification B184-43T) is almost fifteen years old. The specification for *Aluminum and aluminum alloy welding rods and bare electrodes* (AWS Specification A5.10-54T; ASTM Specification B285-54T) is about four years old.

Coated electrodes for welding aluminum have been bypassed in most cases by inert-gas-shielded arc welding; thus, there has been little pressure to revise the old specification. The newer welding rod and bare electrode specification provides for gas welding, which is declining, as well as for Tig and Mig welding. The latter is first choice wherever applicable.

In Table I, the Aluminum Association's *Alloy designation system for wrought aluminum*, which became effective October 1, 1954, has been added for easier understanding. There is a good chance that widespread adoption of AA designations will sweep out confusion caused by proprietary alloys, ASTM and AWS designations, and others. When agreement is reached for cast, as well as wrought alloys, the aluminum picture will be brought into sharper focus.

In chronological order, the following processes have been applied to aluminum welding: gas, metal-arc with coated electrodes, carbon-arc, atomic-hydrogen, Tig and Mig welding. (Table II lists the thickness range for which each of these processes can be used.)

Choice Factors

Among the more important factors that influence the choice of welding process are:

(*1*) type of aluminum alloy,
(*2*) location and position of weld,
(*3*) thickness and size of parts,
(*4*) number of similar welds,
(*5*) production rate required,
(*6*) investment in welding equipment,
(*7*) finish and appearance desired.

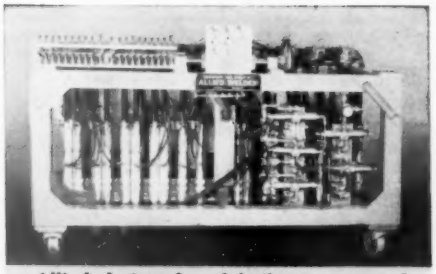
Gas welding: Although the oxy-acetylene flame is by far the preferred heat source for aluminum welding, such fuel gases as hydrogen, propane and natural gas may also be used. Flux is always required to remove aluminum oxide. Careful postweld flux cleaning is essential since residual flux is corrosive to aluminum.

Heavier sections, 3/8 in. thick or more, should be preheated up to 800 F to avoid stress build-up and subsequent cracking.

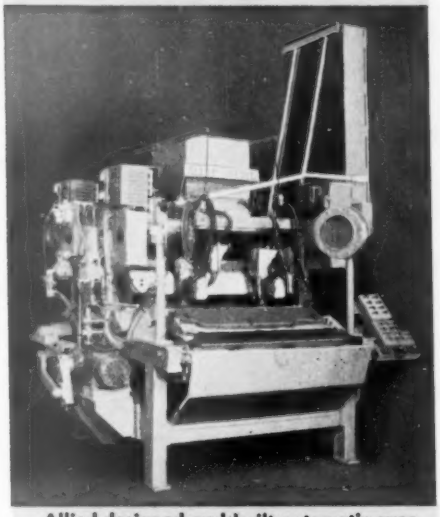
Silicon Fillers

Metal-arc welding with coated electrodes: Welding aluminum with electrode types Al-2 and Al-43 has long been popular. These pure aluminum and aluminum-5% silicon filler met-

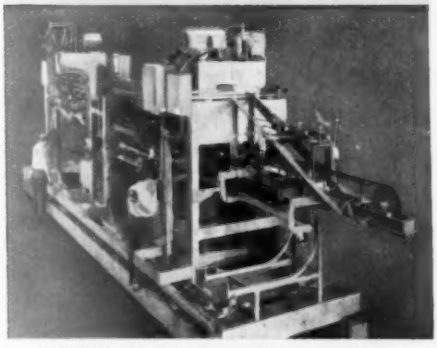
*Assistant manager, Metals Research Dept., Armour Research Foundation of Illinois Institute of Technology, Chicago.



Allied designed and built air operated machine for drilling 20 holes simultaneously in trailer floor.



Allied designed and built automatic over and under arc welder. Welds automotive frame X member.



Allied designed and built automatic two-stage resistance welder with transfer and turn over devices. Welds radiator support assembly.

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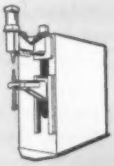
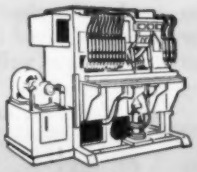
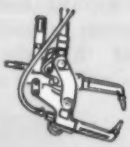


Standard Welders



Special Welders

Automation Equipment



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Creative Design

TABLE I—Chemical requirements for filler metals used in the joining of Aluminum

AWS-ASTM Classification	AA Designation	Al %	Cu %	Fe %	Si %	Mn %	Mg %	Zn %	Cr %	Ti %	Ni %
R-996A E-996A	1060	>99.6	—	*a*	*a*	—	—	—	—	—	—
R-990A E-990A A1-2	1100	>99.0	0.2	*b*	*b*	0.10	—	0.10	—	—	—
R-C4A[c]	—	*R*	4.0-5.0	0.8	1.5	0.30	0.03	0.30	—	0.20	—
R-CN42A[c]	—	*R*	3.5-4.5	0.8	0.7	0.30	1.3-1.8	0.30	0.20	0.20	1.7-2.3
R-CS41A E-CS41A	2025	*R*	3.9-5.0	1.0	0.5-1.2	0.4-1.2	0.20-0.8	0.25	0.10	0.15	—
R-G1A E-G1A	5050	*R*	0.25	0.8	0.50	0.15	1.0-1.8	0.25	0.10	—	—
R-GM50A E-GM50A	5056	*R*	0.10	0.40	0.30	0.05-0.20	4.9-5.6	0.10	0.05-0.20	—	—
R-GR20A E-GR20A	5052	*R*	0.10	*d*	*d*	0.10	2.2-2.8	0.20	0.15-0.35	—	—
R-GR40A E-GR40A	5154	*R*	0.10	0.45	0.45	0.10	3.1-3.9	0.20	0.15-0.35	0.20	—
R-MG11A E-MG11A	3004	*R*	0.20	0.70	0.30	1.0-1.5	0.8-1.3	0.10	—	—	—
R-S5B E-S5B A1-43	4043	*R*	0.40	0.80	4.5-6.0	0.30	0.05	0.30	0.20	0.20	—
R-SC51A[c]		*R*	1.0-1.5	0.60[e]	4.5-5.5	0.50[e]	0.40-0.60	0.30	0.20	0.20	—
R-SB70A[c]		*R*	0.20	0.50	6.5-7.5	0.30	0.20-0.40	0.30	—	0.20	—
R-ZG61A[c]		*R*	0.30	0.8	0.25	0.30	0.50-0.65	5.2-6.0	0.4-0.6	0.10-0.25	—

a—Iron plus silicon shall not exceed 0.4 per cent
b—Iron plus silicon shall not exceed 1.0 per cent
c—For repair of castings
d—Iron plus silicon shall not exceed 0.45 per cent, max.
e—If iron exceeds 0.4 per cent, the manganese should be present in an amount equal to one-half the iron
R—Remainder

als are encased in a heavy flux coating that forms a gaseous envelope around the arc. In the molten pool, flux slags-off the aluminum oxide. Cleaning between passes and post-weld cleaning are time-consuming when compared to newer, fluxless methods. And, in addition to the nuisance of flux cleaning, coated aluminum electrodes created a spatter problem.

Carbon-arc welding. Of historic interest is carbon-arc welding of aluminum and its alloys. Here, automatic welding of long seams was first done by feeding bare filler wire and powdered flux into the arc. For manual welding, a coated filler rod was introduced into the carbon arc with techniques very similar to those employed for gas welding.

Rapid Welding

Atomic-hydrogen welding. Here, again, the heat source distinguishes atomic-hydrogen welding from gas welding. This process is useful for rapid welding of thin aluminum sheets. It also has utility for casting repairs.

Because of the reducing nature of the hydrogen gas shield that surrounds the arc, less flux is needed for gas welding. Neat, smooth welds of good quality can be obtained using filler metals like those recommended for gas welding.

Mig welding. Pushing all the advantages of Tig welding to a logical conclusion, Mig welding eliminated tungsten electrode problems. Now, whenever either process can be employed, a clear-cut advantage for Mig can be found in the cost accountant's records as well as in X-ray soundness of deposit.

Both Tig and Mig processes work well in all welding positions. Because current densities are high, warping and cracking are minimized. Helium, argon, or mixtures of the two shield-

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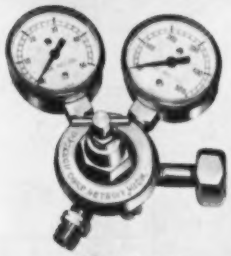

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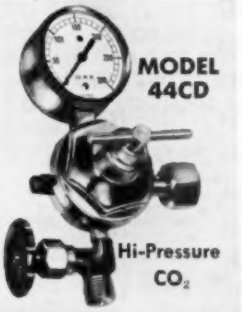

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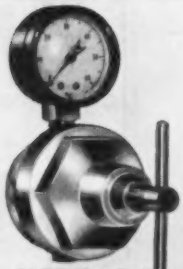

MODEL 44D
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—Courtesy Alcoa

TUBE after aluminum tube was welded by the Tig method in laying 20,000 ft of unprotected pipe line. Here aluminum filler is used.

TABLE II—Aluminum thickness ranges for commercial welding practice

Welding Method	Metal Thickness	
	Minimum in.	Maximum in.
Mig	0.093	*None
Tig	0.051	1
Gas	0.051	1
Metal arc	0.125	*None
Atomic hydrogen	0.051	1

*While there is no process limitation on thickness, most experience covers a range up to 3-in. maximum.

ing gases are common. Welding techniques may be more exacting with these faster methods, but weldors are easily trained.

Filler Metals

Filler metals for aluminum are furnished in coils for Mig welding, or straight lengths for all other welding processes employing filler metals.

Coils for consumable electrodes come in the following standard sizes: 0.030, 0.040, 3/64, 1/16, 5/64, 3/32, 1/8, 5/32, 3/16 and 1/4 in. diameters. Straight lengths of filler metals may be coated or uncoated; the latter are wrought or cast.

Coated electrodes are 14 in. long in diameters: 3/32, 1/8, 5/32, 3/16, and 1/4 in. In electrodes 18 in. long, diameters are: 5/16 and 3/8 in.

All wrought uncoated filler metals are 36 in. long. The following diameters are available in round wrought or cast rods: 1/16, 3/32, 1/8, 5/32, 3/16, and 1/4 in. Lengths may be 12, 18, 24, or 36 in.

Table I shows that filler metals are employed for both wrought and cast aluminum materials. Wrought products may match corrosion resistance or mechanical properties and are most common commercially. Cast products most generally match the castings in composition and may be made from identical melts.

Popular Fillers

While there are many aluminum filler rods to match both wrought alloys and castings, the three most popular types are 4043, 1100, and 5154. Of course, for metal-arc welding with coated electrodes, only the 4043 and 1100 analyses are produced. Some manufacturers offer bare rods for gas, Tig, or Mig welding, while others offer a special line of products for Mig.

The Al-5% Si filler metal, type 4043, has been a universal favorite for welding aluminum for some time. Most repair shops depend upon 4043 to weld aluminum materials of unknown analysis.

Type 4043 filler metal displays a superior fluidity at welding temperatures. When resistance to corrosion is particularly important, type 4043 may not be as satisfactory as a composition that matches the base metal. It does, however, provide good strength and minimizes cracking tendencies.

TABLE III—Typical properties of Mig weld joints in aluminum alloys

Base material	Filler	Postweld heating	Transverse tensile properties: Yield strength	Ultimate strength	% Elongation in 2 in.	Specified minimum tensile strength of base material: O temper	Other temper	
1100	1100	None	6,000	13,500	50	11,000	13,000	H112
3003	1100	None	—	16,000	—	14,000	17,000	H112
3004	5052	None	—	27,500	—	23,000	23,000	H112
5052	5356	None	14,000	28,000	15	25,000	28,000	H112
5056	5356	None	—	38,000	15	42,000*	60,000*	H38
5154	5154	None	—	33,000	15	30,000	30,000	H112
5083	5356	None	22,000	42,500	12	40,000	44,000	H113
5086	5356	None	21,000	37,000	14	35,000	36,000	H112
5356	5356	None	—	40,000	12	38,000	40,000	H112
6061	4043	None	—	27,000	8.5	—	42,000	T6
		T6	—	43,000	0.5			
6063	4043	None	—	20,000	—	—	32,000	T6

*Typical

If a need exists to furnish resistance to specific chemicals, to meet special strength requirements, or to match colors on weldments that are anodized after welding, special recommendations from the aluminum alloy producer and actual test pieces are the safest procedures.

Low Melting Point

Since 4043 melts over a wide range of low temperatures and solidifies at temperatures well below the usual base metal on which it is used, it is often an excellent performer—remaining plastic after base metal has cooled. Thus, contraction stresses that might crack the base metal are relieved by the plastic filler metal.

Type 1100 filler metal possesses outstanding resistance to corrosion and provides the best ductility among the common filler metals. Table III lists some recent values on a variety of aluminum alloy welds made in the laboratory of a leading producer.

Sometimes 5154 is chosen over 4043 when ductility in the zone is required.

Welding fabricators entering the aluminum field for the first time are fortunate to find welding processes which can be quickly mastered. Further, major producers of aluminum have published excellent texts, giving detailed welding data. Often, if production quantities justify field welding engineering service, aluminum or welding material producers will supply it.

Undoubtedly, the rapid rise of aluminum as a construction material has been aided by better welding methods, coupled with better and more weldable aluminum alloys.

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The old army game

OLD ARMY sergeants used to inspire recruits by snarling, "Improvise . . . don't let it rust. Put it to work." Delta-Star Div. of H. K. Porter Inc., has taken note of this economy-minded advice.

The Chicago firm found that a semiautomatic submerged-arc unit, formerly applied to cylindrical fittings, was lying idle. Rather than lose their investment, the welding department improvised, adapting it for straight-line welding on I-beam sections used to tie in other parts on electrical towers fabricated by the company.

A special cam was fitted to the flux cone, which allowed a vertical tilt while welding and raised the hopper at the end of a run. The welding head was mounted on a flame-cutting tractor rolling on a 16-in. track.

Continued use of a moving positioner was now unnecessary. To replace it, a jig was fabricated to hold flat plates for welding. Bars of varying width can be fitted into the jig to hold plates at a proper height and angle.

Power is supplied by a 600 amp d-c constant-voltage generator.

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ARTIST'S sketch of new Hobart Welding Technical Institute. Idea for Institute evolved from Hobart Bros. Trade School which trained and graduated over 20,000 weldors since 1930.

In Troy, Ohio . . .

Hobart begins work on a new welding institute

By a Staff Member

EDUCATION in the welding field, if we may take some liberty with Mark Twain, has been "something a lot of people discuss . . . but few do anything about it."

One of the major manufacturers of arc welding equipment, however, *has* decided to do something about it. Recognizing industry's increasing demands for personnel trained to man supervisory jobs in the welding field, Hobart Bros. Co., Troy, Ohio, has begun construction of an 80,000-sq-ft all-welded building to house its new Hobart Welding Technical Institute.

Training personnel for the welding industry is nothing new for Hobart, which has operated a welding trade school since 1930. In the relatively short space of 27 years, this school has trained and graduated over 20,000 weldors proficient in both arc and oxyacetylene welding.

The standard full-term course consists of 16 weeks of intensive training and practice. However, many courses of instruction also are tailor-made to meet specific needs of every Institute student.

A Further Need

This background of experience has proved to Hobart Bros. that there is a need for a training program which will go even beyond the training of skilled welding craftsmen.

Today's employment demands are not limited to weldors. There is a great need also for foremen, supervisory engineers and engineering assistants with a knowledge of welding.

Therefore, Hobart eventually plans to offer, in addition to comprehensive welding training, courses in metallurgy, welding design, chemistry, physics, mathematics and engineering drawings and materials.

All subjects are designed to give them well-grounded technical know-how in the welding field.

Gaining this added knowledge will require from 16 to 18 months instead of the 16 weeks now required in the welding course. Upon completion of the longer course, however, the student will receive a certificate proclaiming him a welding technician.

Short-Cut

This should provide him with a short-cut to the post of welding leader and to other supervisory or, possibly, liaison jobs between management, engineering and production groups.

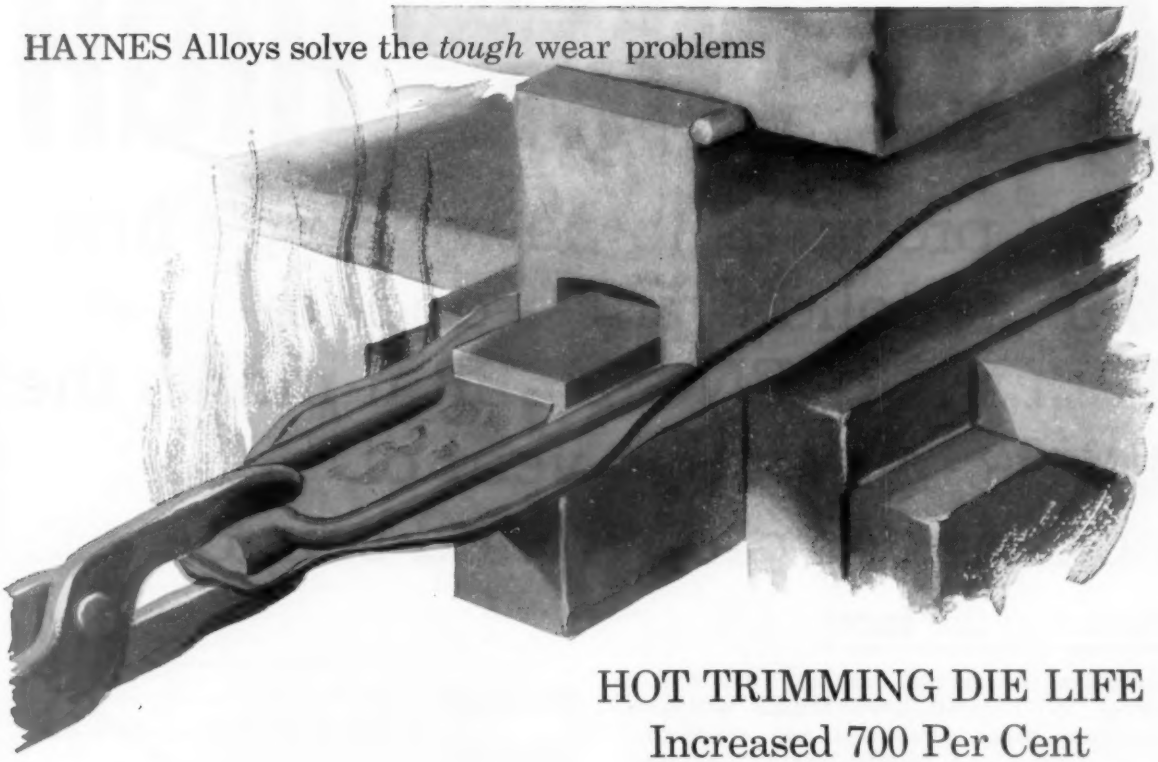
Housing both the present Trade School and the new Technical Institute, the building will provide class rooms, a 250-seat auditorium, demonstration-instruction areas, individual welding booths for student practice and work, laboratories, and modern welding, weld testing and metalworking equipment.

This combination will enable students to carry on research projects for themselves in the field of welding, and it will give them an "inside track" on the latest developments in welding.

WELDOR training courses at present Hobart Trade School *(above)* will be transferred to new Technical Institute upon its completion.

PRACTICING what it preaches, Hobart is welding its new building.

HAYNES Alloys solve the *tough* wear problems



HOT TRIMMING DIE LIFE
Increased 700 Per Cent

HAYNES hard-facing alloys resist the sudden shock of impact and the softening effects of heat . . . two characteristics that make them unusually successful in extending the service life of hot-working equipment. In one plant, hot-trimming dies hard-faced with a HAYNES cobalt-base alloy removed the flash from 25,000 parts before they had to be reconditioned. This was a 700 per cent increase in service life over unprotected dies. In this instance the parts were heated to 2000 deg. F just prior to the trimming operation.

If you have a problem involving a combination of heat and impact, straight abrasion, or corrosion, you will find that there is a HAYNES hard-facing alloy that can solve it . . . economically. The hard-facing deposit will increase the service life of the part and, because of its superior wearing qualities, permit you to use a less expensive base material.

Write for literature or call one of our sales offices. HAYNES STELLITE COMPANY, Division of Union Carbide Corporation, Kokomo, Indiana. Sales offices in Chicago, Cleveland, Detroit, Houston, Los Angeles, New York, San Francisco.

This trimmer die, being touched up with a HAYNES nickel-base alloy, has trimmed over 20,000 parts. The hard-facing alloy is tough, machinable, and can be applied to all common die steels by the metallic-arc process.

HAYNES
ALLOYS

HAYNES STELLITE COMPANY
Division of Union Carbide Corporation
Kokomo, Indiana

UNION CARBIDE

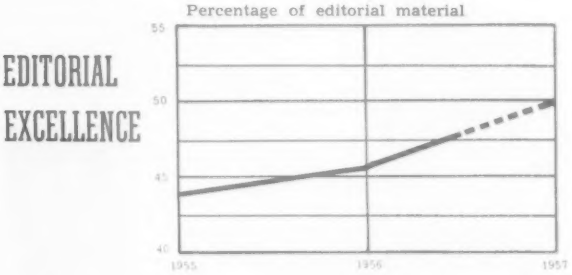
The terms "Haynes" and "Union Carbide" are registered trade-marks of Union Carbide Corporation.

ALL TIME HIGH

1957 promises to be welding's first billion-dollar year... and for WELDING ENGINEER it marks the third consecutive year of continuous growth and service.

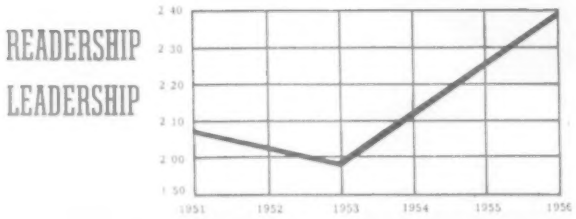
Here are the facts:

Pacing the record breaking industry it serves, WELDING ENGINEER will soon complete three successful and rewarding years under new management. Dynamic growth of WE is evidenced in many ways—more and better editorial material . . . more advertising pages . . . more advertisers . . . greater readership. We are proud of our achievements, and of the recognitions we've received from you and the rest of the industry.



WELDING ENGINEER'S editorial superiority has been recognized for almost 42 years. One key to that superiority is WE's balance—a careful harmony in reporting the uses of all welding processes. WE is easier to read . . . yet gives ALL pertinent facts in every article.

Only Welding Engineer Publications, Inc., devotes its full energies to one phase of the metal-working industry. This specialization is your insurance policy—it means that your advertising message is being read by the influential men in welding.



WELDING ENGINEER'S editorial leadership is measured in many ways:

(1) More people spend more time reading more of WE—in 1951 the average reader spent 2 hours 2 minutes with WE; today he spends 2 hours 37 minutes.

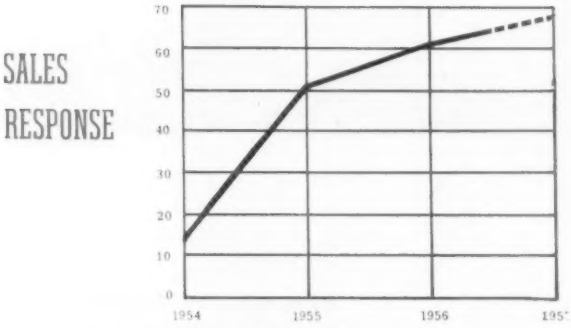
(2) Pass-along readership is high—a recent analysis of responses to advertisements in WE showed that 2 out of every 5 came from non-subscribers. That's 40% pass-along readership.

(3) More people prefer WE's editorial material—queried in preference studies, customers of 12 leading welding equipment manufacturers chose WE, 3 to 1, over the second book.

(4) The world's oldest paid-circulation magazine in its field, WELDING ENGINEER is proud of its thousands of readers who annually proclaim their preference by paying for the magazine.

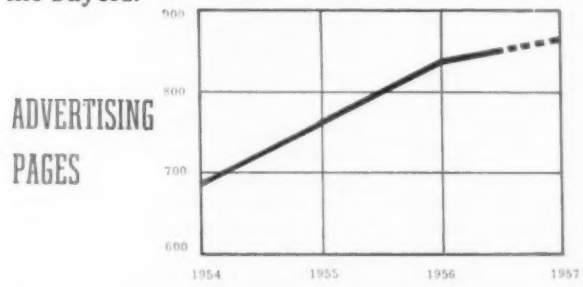
(5) Reprint requests are skyrocketing—just two issues of the past summer generated requests for more than 5,000 reprints and tearsheets.

in the welding market



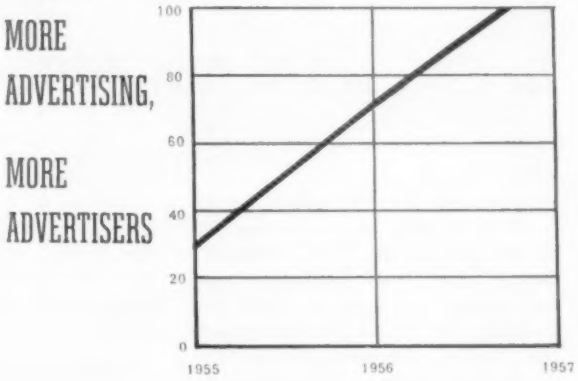
Gage for yourself reader response to advertising in WE: more than 60,000 inquiries were received in 1956. This record will be smashed in '57 . . . through August, almost 48,000 sales leads had been processed WE's astronomical pulling power, which began at our rebirth almost three years ago, is destined to continue.

These sales leads are your path to welding's prime movers—the influential men, the buyers.



A magazine's growth is measured in the amount and quality of advertising it attracts. Significantly, WE has increased its number of advertising pages in each of the past three years, opening the door for more editorial pages. WE readers now benefit from greater service . . . and get welding's biggest bargain.

No other magazine in the welding industry has grown like WE in this period. In 1957, there will be 28% more advertising pages in WELDING ENGINEER than when the present management assumed control.



In the brief period since Jan. 1, 1955, 97 companies have joined the growing ranks of WELDING ENGINEER advertisers. This mark of confidence has sparked a more distinctive publishing job . . . but we're not standing still. WELDING ENGINEER pledges even greater benefits in the months and years ahead!

PLACE YOUR SALES MESSAGE in the welding industry's MOST PREFERRED and MOST HELPFUL and fastest-growing magazine...

WELDING ENGINEER

the leader in
developing high-quality sales response

NOV. 2-8

2nd World Metal Congress in Chicago's Amphitheatre

"IT WOULD be impossible to see in 12 months what one can see in five days at the Chicago Amphitheatre," says W. H. Eisenman about the coming 2nd World Metallurgical Congress. He is secretary-general of the Congress and managing director of the 39th National Metals Exposition, to be held at the same time.

The second world conclave on metal resources, their conservation and application, is scheduled for Nov. 2 through 8. The American Society for Metals will host the event.

From across the seas come some 500 key metal scientists from 40 nations. At the show they will mingle with an expected 50,000 members of the American metal working industry.

The metal show is one of the multi-billion dollar industry's scientific forums and a tool for sales. "It is a common ground for quick exchange of information on procedures and equipment with an end view to cutting costs and bolstering profits," explains the ASM. The industry anticipates record 1957 sales of $138 billion.

Joining the ASM in the five-day meeting will be the Institute of Metals Div. of the American Institute of Mining, Metallurgy and Petroleum Engineers and the Society for Non-Destructive Testing. Both will headquarter at the Morrison Hotel. Other groups cooperating in the show are the Special Libraries Association, Metal Powder Association and the Industrial Heating Equipment Association.

Exhibits Galore!

Under one roof and on one floor in Chicago's Amphitheatre, 200,000 sq ft of floor space will be blanketed with 450 exhibits. Automotive and guided missile work will be played up in the exhibits, since the recent Defense Department cut in output of manned aircraft.

"All exhibits will stress, however, the 'spending-to-save' theme—the purchase of new equipment designed to cut operating costs by speeding production," said Eisenman

Welding of rare metals, metallographic techniques required for radioactive materials and plutonium—subjects only recently de-classified by the government—will be discussed in two Atomic Energy Commission sessions. The AEC talks will be part of 170 American Society for Metals technical presentations.

Eighteen top U. S. metal scientists will moderate international panels, involving some 125 overseas and U. S. metal experts. They will discuss world metal problems of current concern.

ASM has scheduled 20 seminars on metal characteristics. All meetings will be in the Palmer House and Hotel Sherman.

Symposium on Titanium

The Metals Div. of the American Institute of Mining & Metallurgical Engineers will sponsor 22 symposiums, seminars and papers. On Nov. 5 they will hold a "Symposium on titanium" and a session on "Titanium's progress—at home and abroad."

The Society for Non-Destructive Testing, holding its Second International Conference in conjunction with the metal show, will hold 10 major sessions. A discussion Nov. 3 will be "Cooperation in the field of non-destructive testing," Nov. 5, "Non-destructive testing of nuclear power reactor components," and Nov. 6, "Relative advantages and limitations of non-destructive test methods." Both groups will meet at the Morrison Hotel.

Six technical papers will be given by the Industrial Heating Equipment Association, including "Automation in heating and quenching," delivered by N. K. Koebel of Lindberg Engineering Co.

The Metal Powder Association will give three papers, and speakers from France, England and Germany will be featured on the roster of the Metals Div. of Special Libraries Association meetings. It will sponsor a display booth and information center at the Amphitheatre. In store for foreign visitors is a tour of the John Crerar library, the largest technical library in the world.

Luncheon at the Waldorf

Foreign visitors will be welcomed with a luncheon at the Waldorf-Astoria in New York City, then they will trek through about 70 metal working plants on their way to Chi-

cago. These industrial inspection tours will be divided into eight major industries, including welding and joining, steelmaking and refining, nonferrous refining, metal fabrication, heat treatment, etc.

Exhibitors listed for the big show include: American Brake Shoe Co., American Chain & Cable Co., Inc., American Gas Assn., American Optical Co., American Silver Co., Ampco Metal, Inc., Amperex Electronic Corp., Arcair Co., Aro Spotwelder Div., Balteau Electric Corp., Banner Welder, Inc., Black & Decker Mfg. Co., Buck Mfg. Co., Budd Co.

Cam-Lok Div., Empire Products Inc., Cincinnati Milling & Grinding Machines, Inc., Clementina Ltd., Detroit Testing Machine Co., Eastman Kodak Co., Fansteel Metallurgical Corp., General Dynamics Corp., Goldsmith Bros. Smelting & Refining Co., Handy & Harman, Haynes Stellite Co., High Voltage Engineering Corp., Hobart Brothers Co., International Nickel Co., Lepel High Frequency Laboratories, Inc., Lindberg Engineering Co.

And More . . .

Linde Air Products, Magnaflux Corp., Metal Removal Co., Metallizing Co. of America, Metallizing Engineering Co., Inc., Met-L-Chek Co., Minnesota Mining & Mfg. Co., Mitchell Radiation Products Corp., National Carbon Co., National Lead Co., National-U. S. Radiator Corp., Nelson Stud Welding, North American Philips Co., Inc., Picker X-ray Corp.

Portomag, Inc., Skil Corp., Smith Welding Equip. Corp., Steel Sales Corp., Tempil Corp., Thor Power Tool Co., Arthur Tickle Eng. Works, Inc., Titanium Metals Corp. of America, Triplett & Barton, Inc., Turco Products, Inc., Weltronic Co., Westinghouse Electric Corp., Wheelabrator Corp.

Dr. Zay Jeffries heads the World Metallurgical Congress as director general. He is retired vice president of General Electric and is currently an active consultant to the Department of Defense.

METAL SHOW HOURS
Nov. 4, 5, 6—12 noon-10:30 p.m.
Nov. 7, 8—10 a.m.-6 p.m.

Aluminum-bronze centrifugal castings welded at high speed

MIG-welded automatically with AMPCO-TRODE* 160 Spooled Wire

In string-bead welding this large paper-mill breast roll, wire feed was 88 inches per minute; travel, 15 inches per minute. There was no oscillation or peening, no burnback. No preheating was necessary — weld metal flowed uniformly into side walls and adjoining beads.

With layer-level wound Ampco-Trode 160 wire, you get fast, easy welds on overlays and many hard-to-join, dissimilar metals. Deposits have high strength, resist squashing-out in bearing service, and resist corrosion.

Order Ampco-Trode 160 Spooled Wire from your nearby Ampco distributor. Or mail coupon below today.

Sole producer of genuine Ampco Metal

AMPCO®

AMPCO METAL, INC.,
Dept. WE-10, Milwaukee 46, Wisconsin
West Coast Plant: BURBANK, CALIFORNIA

*Reg. U. S. Pat. Off.

W-146

Tear out coupon and mail today!

AMPCO METAL, INC.
Dept. WE-10, Milwaukee 46, Wis.

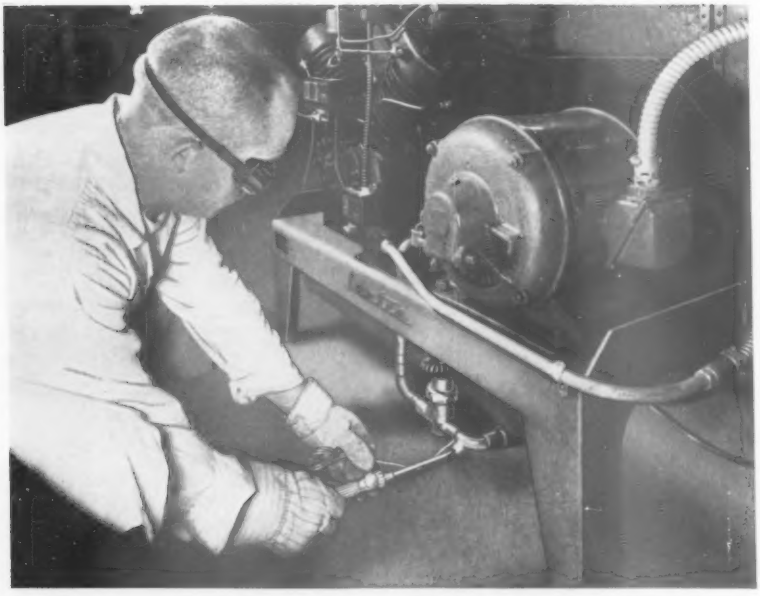
Send me Bulletin W-17 for further information on Ampco-Trode 160 Spooled Wire and other Ampco electrodes.

Name_____

Company_____

Address_____

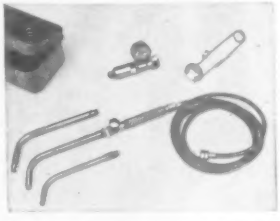
City_____ Zone____ State_____



Operator using SMITH "Handi-Heet" torch to repair fittings on air-conditioning unit.

NEW...air-acetylene torch assures fast, economical heat

USES ATMOSPHERIC AIR and acetylene only—*needs no oxygen.* With this new "Handi-Heet" Soldering Torch Kit, refrigeration and air conditioning men, plumbers, auto repair men, etc., have an ideal source of fast, clean, economical heat. You can solder, braze, lead, thaw, and do dozens of other every-day jobs. SMITH's "Handi-Heet" Kits are complete units—ready to attach to any acetylene tank and go to work. Models available for all commercial tanks, and styles "B," "P.O.L." and "MC" tanks.



Here's what you get in each SMITH'S "Handi-Heet" Kit: torch set with 3 tips; accurate pre-set acetylene regulator; 6 ft. of 3/16" hose; torch lighter; metal carrying case.

TIPS SEAT WITH finger-tip pressure and can easily be adjusted to any convenient position. Flexible "O" rings form a gas-tight seal between the tip mixing section and torch head. An unusually wide range of flame variation is provided in each tip by a leak-proof needle valve that can be instantly adjusted by the operator.

Additional tips are available to handle jobs from delicate jewelry work to heavy soldering and heating. Torches are made of solid brass—won't crack, break or deteriorate.

SMITH'S

SMITH WELDING EQUIPMENT CORPORATION

Write today for details

2633 FOURTH STREET S. E.
MINNEAPOLIS 14, MINNESOTA

One of America's pioneer manufacturers of equipment for welding, cutting, heating.

FINISHED condenser being examined to be sure all welds are proper and unit will withstand chlorides.

Mig gives . .

X-ray quality welds

SPECIAL WELDING skills and experienced weldors produced X-ray quality welds on zirconium tetrachloride condensers fabricated from Inconel by Rolock, Inc., Fairfield, Conn.

The condensers will form part of the equipment needed for a new process, which reportedly will produce zirconium at nearly one-half the current market price.

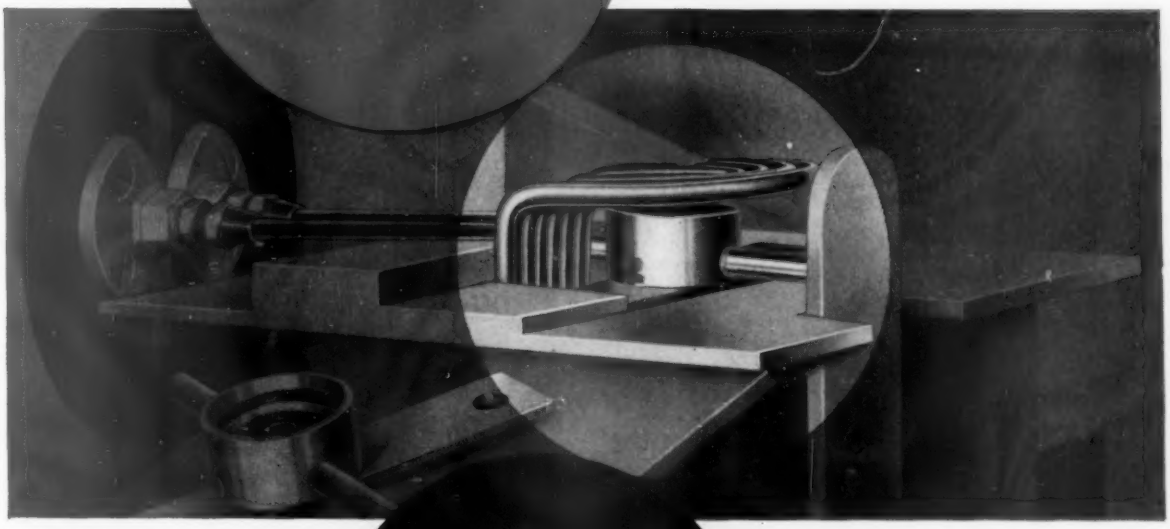
This equipment will be installed at the Pensacola, Fla., plant of Columbia-National Corp. The zirconium will be supplied to the AEC and to private industry.

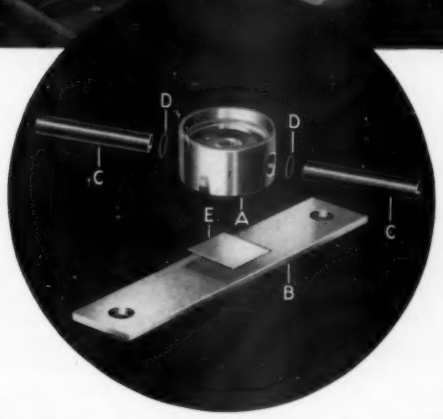
Condenser welds were made manually by the Mig (metal inert-gas) process. Argon was the shielding gas, and the 0.045-in. Inconel filler wire travelled at adjustable speeds. After welding was completed, all deposits were X-rayed with portable gamma ray equipment to insure highest quality.

The condensers themselves are 13-ft-high Inconel columns with a 3-ft ID. The columns will be partially covered with a mild steel jacket through which cool air is blown.

The unit condenses zirconium tetrachloride, which changes from a gaseous to a solid form at 626 F. Condensers must be sound enough to absorb exposures of heavy concentrations of chlorine as well as small amounts of metallic chlorides.

PHOSON SIMULTANEOUSLY BRAZES 3 GAS-TIGHT JOINTS IN 60 SECONDS





Assembly in position for induction brazing, and fully brazed assembly in slide off cooling position.

This bypass valve, for use with a telephone cable pressurization program, was designed for *strength, gas-tightness, corrosion resistance, long life* and *mass production.*

Here's what the problem involved: a brass machined hub (a) had to be fastened to a plate (b) and two copper tubes (c) fastened to the hub. Because the finished joints had to embody all the requirements of the base materials, low temperature brazing with Phoson and Sil-Flux was chosen. Two Phoson rings (d) ¼" ID x .031 wire and a Phoson shim (e) ¾" square x .003 were specified. By induction brazing with Phoson and Sil-Flux, the four parts were joined simultaneously in just 60 seconds!

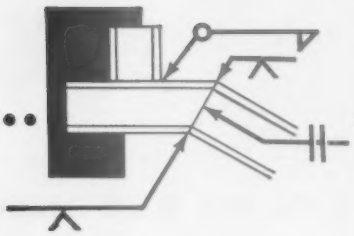
For dependable, economical mass production metal joining, with *highest* possible strength at *lowest* practical temperatures, specify L.T.* brazing — and for L.T.* brazing alloys . . . specify the best: Phoson or Sil-Bond with Sil-Flux.

*Low Temperature

CALL YOUR UNITED WELDING SUPPLY DISTRIBUTOR

UNITED WIRE

PROVIDENCE 7, R. I. OFFICES IN PRINCIPAL CITIES



the welding clinic

Here you may find the solution to your welding problems, whether they concern design, production, construction or maintenance welding. Submit your questions for answering on this page.

Gas welding information for work on plastics

Question:

What is plastic welding, on what materials is it used, and how is it done? In particular, we would like information on gas welding plastics.

Answer:

Germany was the first country to use plastic welding. Tin, lead and copper were in short supply during World War II, and technicians used welding to join plastic piping.

Plastics are grouped in two categories: thermoplastic and thermosetting types. Thermoplastics are most frequently chosen for welding applications. These materials, even after they have been heated, molded and allowed to set, can be re-worked. Thermosetting types, however, can only be heated and molded once.

Most important members of the thermoplastic family are polyethylene, polyvinyl chloride and methyl methacrylate. Over 90% of all plastic welding is done on the first two types. Methacrylate and other materials are seldom used.

Welding Methods

Four methods are used to join thermoplastics. Welding by friction is usually done by rapid rotation of one-half an assembly against the other half. Frictional heat generated will fuse the sections together.

A second method of welding plastics is through the use of heated tools. Polyethylene bags, often used to hold candies, fruits or vegetables are closed by applying a hot iron to the open edges: the plastic melts and the bag is sealed.

Plastics may also be joined by electrodes carrying high-frequency current. Used most often in fabricating beach balls, raincoats and shower curtains, high-frequency welding works best on polyvinyl chloride, polyvinylidene chloride, acrylates, and polyamides. Polyethylene cannot be joined by this method.

Although HF machines are available for welding ⅛ to ½-in. plastic sheets, they are seldom used. It is believed, however, that an increasing demand for mass-produced plastic goods will also increase popularity of high-frequency machine welding.

Gas Welding Plastics

The fourth method of joining plastics—and the one which is of particular interest to you—is by gas welding. Many of the rules which apply to this joining method are also encountered when arc or gas welding metals.

Plastics to be joined by a gas torch must be beveled. If a butt weld is called for, edges should be beveled to form a 60 to 70-deg included angle. A cover pass should be made on the back of such butt welds for added strength.

Beveling of plastic is simple and inexpensive because it can be done on circular saws, bandsaws, or even by filing and sanding. Abrasive cleaners should be used for surface preparation; liquid chemical cleaners are not recommended.

Composition of plastic filler rods for gas welding is identical to that of material being welded. In terms of size, ⅛ and 5/32-in.-diameter rods are most popular at present, but some ¼-in. rods are being used. Larger rods are seldom employed because plastic is a poor heat conductor (as you may have noticed if you wear a plastic raincoat).

When welding polyvinyl chlorides, the rod is held at a 90-deg angle to the bevel. This angle can be decreased to 45 deg if softer polyethylenes are being joined. Plastic filler rod does not form a natural homogeneous mass with base material; the pressure applied to force the rod into the beveled joint is necessary to achieve this desired union.

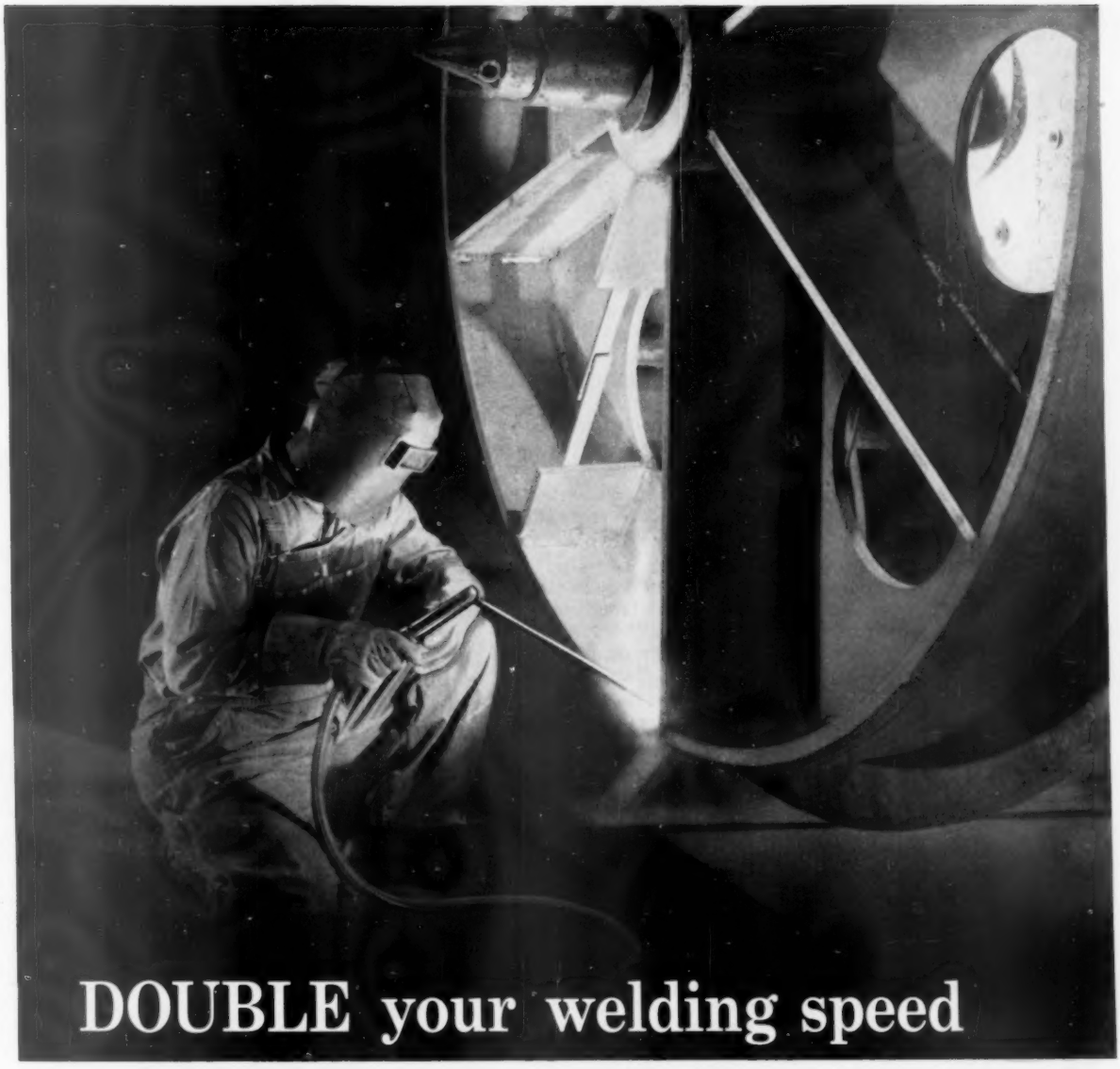
Flameless Torch

The torch used to gas weld plastics is a flameless type operated, usually, by electricity. The compressed air or neutral gas fed through the torch is heated to a point between 400 to 600 F as it passes over an electrically-heated coil at the orifice. Gas or air temperature may be regulated by adjusting rate of flow or by moving the torch tip closer to, or farther from, the workpiece.

Tensile strength of butt welded plastics is approximately 85 to 90% (and is measured from two to six hours after welding is completed). A fillet weld will not develop comparable strength, and may have to be reinforced if it is to be subjected to heavy strains.

Plastics are welded manually at speeds of 3 to 8 in. per minute. Some experimental machines have stretched this rate to 30 ipm, but automatic welding of plastic goods now being produced is economically unfeasible.

The Editors will make every effort to answer all questions submitted to this department. If you have a question concerning welding or related processes—or a tip you would want to pass along to other readers—send it to *The Welding Clinic*.



DOUBLE your welding speed

with P&H Iron-Powder Electrodes

That's right! You can cut welding time in half with P&H Iron-Powder Electrodes. The high thermal energy of their special coating speeds deposition, enabling your operators to produce smooth, x-ray quality welds by simply dragging the rod. Spatter is exceptionally low and welds are practically self-cleaning . . . possess high strength with greater impact qualities at low temperatures.

These high-speed electrodes are also available with Iron-Powder Low-Hydrogen coatings. As a result, you can get ultra-fast welding of problem steels with little or no pre-heat. The superb quality of the chemical coating prevents underbead cracking and porosity . . . eliminates costly rewelds. Their extraordinary mechanical properties make them ideal for welding heavy sections that are subject to severe shock and abuse. What's more, they cost less than conventional high-alloy electrodes.

For types and sizes, send for Bulletin R-29. Write Dept. 325B, Harnischfeger Corp., Milwaukee 46, Wisconsin.

HARNISCHFEGER

P&H WELDERS • ELECTRODES • POSITIONERS

MILWAUKEE 46, WISCONSIN

PAGE-the welding wire

① WIDE RANGE OF ANALYSES •

• When you standardize on PAGE welding wire for your needs—whether for automatic or manual operation, arc or gas welding—you gain all three of these advantages: *first*, you can secure the exact wire you need from PAGE's wide analysis range; *second*, we employ many modern methods of packaging for your convenience in handling and use; and *third*, you can count on prompt delivery service from a nearby authorized PAGE Distributor, who is backed by conveniently located PAGE warehouse stocks.

PAGE has unsurpassed facilities, experience and special skills for drawing and furnishing the right wire for your welding applications. We are ideally equipped to manufacture wire to any desired size, temper or surface finish.

We purchase our raw materials to rigid specifications; we select heats of steels for optimum characteristics—then, upon delivery and before processing, we analyze samples for conformity with our specifications. Thus, PAGE is *the one supplier* in a perfect position to control the chemical and physical properties of its product *from billet to rod to wire!*

Solving tough welding problems

We maintain a fully-equipped and competently-staffed Welding Laboratory where constant research in welding-wire development is conducted —and where many solutions have been found to welding problems that hitherto had defied solution. Here are two typical examples:

1 • Good welds on T-1 steel • Making satisfactory submerged arc welds on T-1 steel had long been very difficult—but a special rod developed in the PAGE Welding Laboratory was recently introduced and already has become the established favorite for this application. As welded on mild steel with inert gas, it gives a tensile strength of 80,000 p.s.i. and elongation of 40%. With proper submerged arc flux, it gives as high as 115,000 p.s.i. and 18% elongation, thus closely matching the physicals of T-1 steel. This is the first automatic welding rod ever produced that makes 100% satisfactory welds on T-1 steel. Its characteristics make it a fine rod also for all-around low-alloy welding.

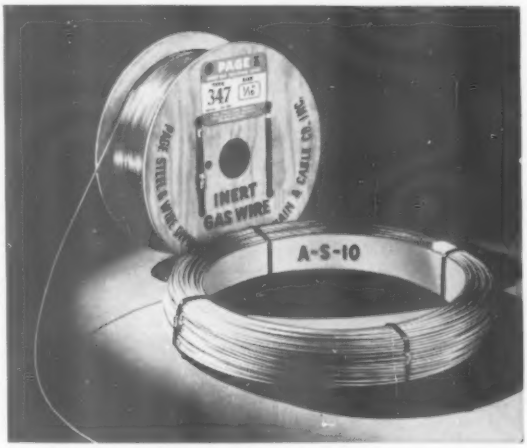
2 • Welding on difficult steels • A manufacturer had been unable to find a welding rod for a weldment that would produce less than 50% rejects. Then he tried a new PAGE alloy rod originally developed for high-temperature (1000° F.) service. Rejects fell practically to zero! Research revealed that this rod, an exclusive PAGE product, possessed properties that make it ideal for difficult low-carbon steels, and particularly in the "hard-to-weld" range from .20 to .45 carbon.

Perhaps you have troublesome weldments on your hands. If so, it will be to your advantage to consult with PAGE.

Write to us at Monessen, Pa., or to the nearest PAGE District Office (opposite page).

Wire to Fill Your Needs— Wide Analysis Range

The PAGE line contains *26 different analyses*, covering the field of applications: heavy automatic submerged arc...light manual submerged arc...inert gas manual...automatic, tungsten or metal arc.



AUTOMATIC WELDING WIRE

CARBON STEEL...Any carbon from Armco (.025 max.) to high carbon (.70-.84)

LOW ALLOYS...All the most popular welding grades

STAINLESS...All standard AISI grades. Other types on request

GAS WELDING RODS

PAGE Gas Welding Rods have long been recognized as the standard of quality, uniformity and dependable performance. These rods, in an exceptionally wide range, are furnished in coils, on reels or in 36-inch lengths, in the following materials: medium or high carbon steel, mild steel, Armco, low alloy, stainless steel, manganese bronze, naval bronze.

BARE ELECTRODES

PAGE Bare Electrodes are available in any carbon from Armco to high carbon (.70-.84).

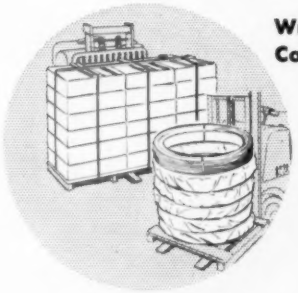
METAL SPRAY WIRE

PAGE Metal Spray Wire is supplied in: any carbon from Armco to .80 carbon, low alloy, stainless steel, manganese bronze, naval bronze.

with 3 big advantages...

②MODERN PACKAGING · ③PROMPT SERVICE

PAGE Packaging Means Protection and Convenience

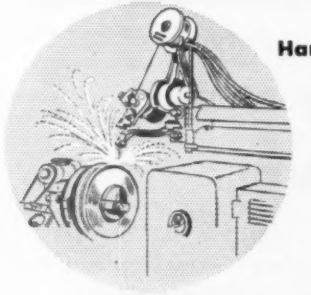


Wrapped Coils... Coils in Cartons

Single and palletized coils, each coil steel-strapped and wrapped in waterproof paper...Also, single and palletized coils in individual cartons.

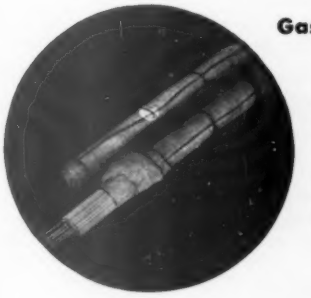
Welding Wire in Coils

PAGE A-S Automatic Welding Wire is regularly furnished in layer-wound coils with cardboard liner, four Signode straps for easy coiling and unwinding—palletized as necessary.



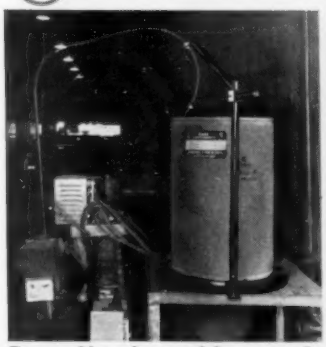
Handy Reels

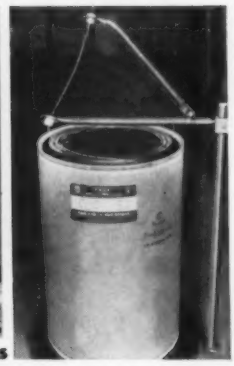
PAGE Inert Gas Welding Wire is available on 25-lb., nonreturnable palletized reels to fit all popular inert-gas welding machines. Wire is precision thread-wound.



Gas Rod Packing

PAGE Gas Welding Rods are supplied in 36" lengths in 50-lb. bundles, paper and burlap-wrapped. Also in burlap-wrapped coils and 150-lb. (approx.) reels. Stainless rods also available in 10-lb. fibre-board cartons.





Pay-off-paks and Leverpaks

PAGE *Pay-off-paks* permit *continuous feeding of wire up to 600 lbs. (from 20" Pak) or 850 lbs. (from 23" Pak) without rethreading.* Wire is properly coiled, free from welds, kinks or twists. *Pay-off-paks* insure uninterrupted production at increased welding speeds. Can be mounted on floor or bench (*see photos above*). Both *Pay-off-paks* and lightweight *Leverpaks* (*not illustrated*) give protection against distortion and corrosion...are easily opened, resealed, handled, stored. Palletized when requested.

Prompt delivery from local stocks

PAGE automatic arc welding wire and oxy-acetylene welding rods are readily available from PAGE warehouses shown at bottom of this page—and from a nearby PAGE Distributor, wherever you live. Your PAGE Distributor saves you time by filling your needs promptly from his stock. This helps keep your inventory investment down!

Send for These...

Folder DH-402A
PAGE Submerged Arc and Inert Gas Welding Wire

Booklet DH-1277
PAGE Gas Welding Rods

Welding Rod Comparison Chart . . . detailing physical properties as welded of various gas, electric, automatic and spray type welding rods—also typical uses of various rods

Write our Monessen, Pa., office for any or all

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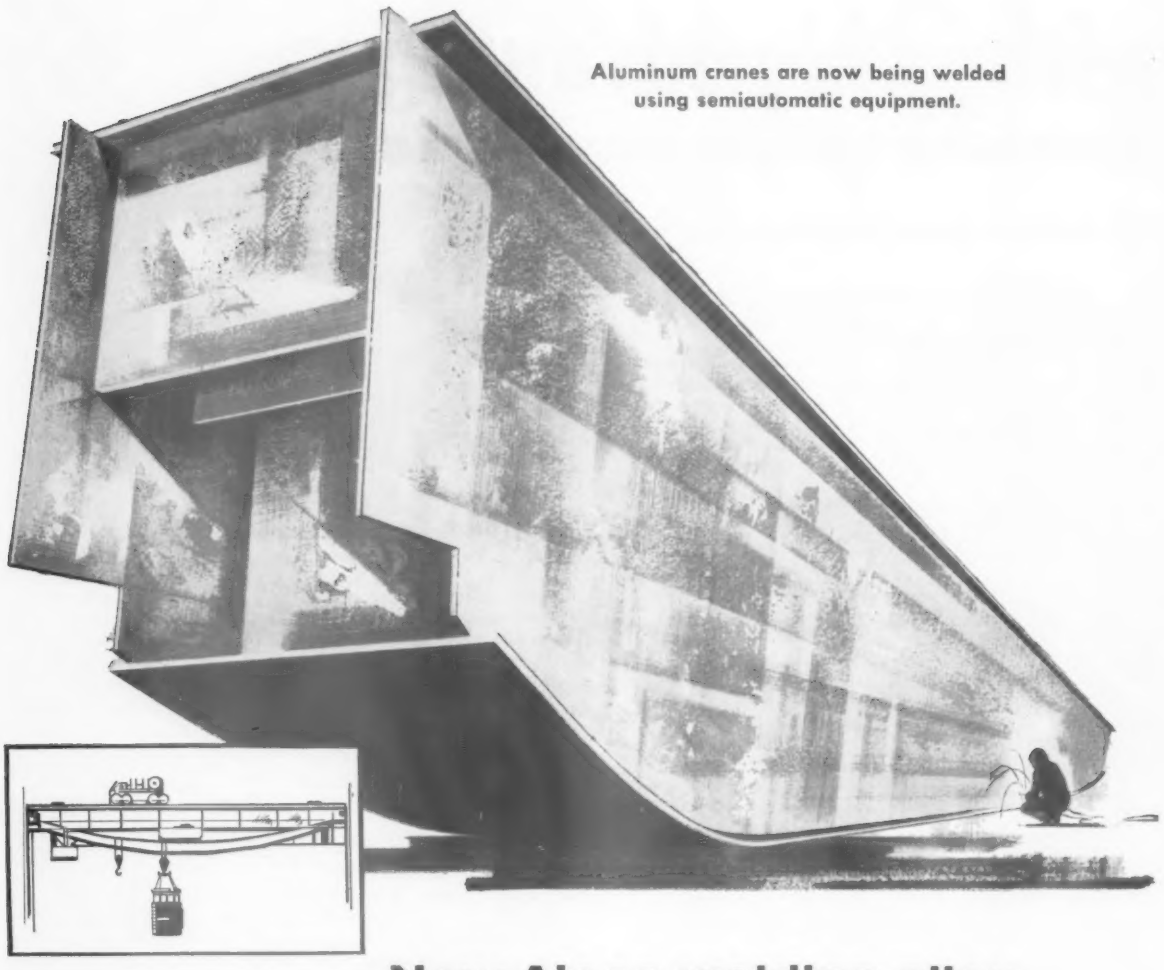
*Indicates PAGE warehouse stocks



Aluminum cranes are now being welded using semiautomatic equipment.

New Alcoa welding alloy makes possible the aluminum crane

For a long time, the idea of an aluminum crane has interested designers. Much lighter in weight, it would permit lower cost building foundations or a higher capacity crane on the same foundations. But how to make it? Riveted construction is outmoded and expensive.

Now aluminum cranes are being built, thanks to a new Alcoa alloy. Designated 5456, this new alloy has the highest as-welded strength of any commercial aluminum alloy yet developed. Guaranteed minimum properties are 42,000 psi ultimate and 19,000 psi yield on the plate and equally good ultimate strength across the weld.

Using the new alloy and the inert-gas consumable-electrode process, it costs no more to fabricate aluminum cranes than steel cranes. There are long welding runs involved, up to 60 feet, and semiautomatic equipment is used. Speeds as high as 80″ per minute are achieved.

In addition to their light weight, these aluminum cranes can be used in corrosive atmospheres and will require no painting.

Alcoa is headquarters for fresh and exciting ideas like this on how to weld, braze or solder aluminum. Get in touch with an Alcoa distributor listed at right. And write now for booklets and films that show how easy it is to weld, braze and solder aluminum. Aluminum Company of America, 1740-K Alcoa Building, Pittsburgh 19, Pa.

NEW! "ALCOA THEATRE"
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ALCOA ALUMINUM
WELDING PRODUCTS
ALUMINUM COMPANY OF AMERICA

Your Guide to the Best in Aluminum Value

Want technical help in welding, brazing or soldering aluminum? Contact your Alcoa sales office, listed under "Aluminum" in the Yellow Pages of your phone book.

For immediate delivery of Alcoa welding products, call your Alcoa outlet listed below. He carries a complete range of alloys and sizes.

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Hinkle Supply Co.
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Pacific Metals Company, Ltd.
San Francisco
Pacific Metals Company, Ltd.
COLORADO
Denver
Metal Goods Corp.
FLORIDA
Jacksonville
J. M. Tull Metal & Supply Co., Inc.
Miami
J. M. Tull Metal & Supply Co., Inc.
Tampa
J. M. Tull Metal & Supply Co., Inc.
GEORGIA
Atlanta
J. M. Tull Metal & Supply Co., Inc.
Southern Oxygen Co.
ILLINOIS
Chicago
Machinery & Welder Corp.
Steel Sales Corp.
Moline
Machinery & Welder Corp.
KENTUCKY
Louisville
Williams and Co., Inc.
LOUISIANA
New Orleans
Metal Goods Corp.
MARYLAND
Baltimore
Southern Oxygen Co.
Whitehead Metal Products Co., Inc.
Bladensburg
Southern Oxygen Co.
Salisbury
Southern Oxygen Co.
MASSACHUSETTS
Cambridge
Whitehead Metal Products Co., Inc.
MICHIGAN
Detroit
Steel Sales Corp.
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Acetylene torches on granite . . . what will this versatile tool tackle next?

Torches give life to granite

By John P. Alexander, *Secretary*

Cold Spring Granite Co.
*Cold Spring, Minn.**

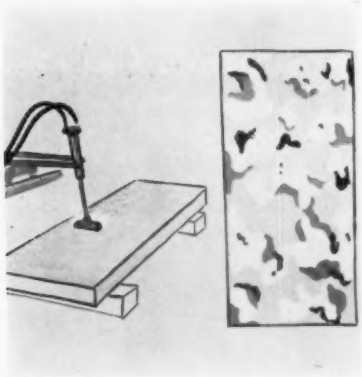
WHEN THE WORLD was young it was soft and plastic. Millenia slipped by and the earth contracted and congealed. It was no longer plastic but solid. This, scientists say, describes the formation of igneous rock.

Beneath our feet lie ten miles of rock. Approximately 90% of it is the original igneous rock. The remaining percentage is sedimentary rock eroded from its parent, and metamorphic rock—igneous material changed under tremendous heat and pressure.

Granite is a form of the igneous beginnings. It is studded with minerals like feldspar, quartz, mica and biotite, ranging in hues from clear crystal through pink, red, gray, black and white.

*Based on a paper presented by the author before an annual meeting of the International Acetylene Ass'n. in Minneapolis.

SKETCH of granite face showing crystal affected by texturing.



THERMAL texturing and cross section of how crystals are brought out.

Physical Properties

The crush-resistant strength of granite is approximately four times as great as good concrete. The material is as hard as glass, and possesses surface qualities that are actually similar to those of glass.

Partly because of its attractiveness and partly because of its favorable physical properties, granite was for many centuries the popular choice for structures ranging from Cleopatra's Needle to modern shopping centers in New York, Minneapolis and San Francisco. But as material and labor costs rose, granite's popularity as a construction material fell.

Oxyacetylene torches are now putting this tough, but striking, stone back on the list of desirable building elements.

A Simple Operation

The dramatic qualities of granite's crystalline materials are being brought out with torches in a simple operation developed by Linde Co.

Water flows over a coarse-grained granite block as a torch with a 4-in.-wide, 6,000-F flame is swept continually over the surface at a height of 1 in. This treatment splits feldspar and quartz crystals along cleavage lines. The result is a textured, reflectant surface.

Since the heat has little effect on biotite and mica in the stone, a rough surface results with feldspar and mica protruding above the others. Various angles of sunlight create interesting highlights on the surface and result in an ever-changing appearance.

BLACKED-OUT areas on map indicate 241 counties containing the 168 leading metropolitan areas which now account for 75% of U. S. manufacturing employment. *Welding Engineer's* Research Dept. finds indicated sales volume in these counties of $650 million.

(Base map copyright Rand McNally & Co.)

Into 4th quarter, welding heads for a $1 billion year

In May, 1957, **Welding Engineer**'s *Research Dept. published welding's 1956 record sales figure of $929,869,413. The Department also pointed out that $1,000,000 in sales was a likelihood in 1957. Here are facts to back this prediction.*

By T. B. Jefferson

BUSINESS IS GOOD. That's the opinion of everyone associated with the welding industry as we enter the fourth quarter of 1957.

After the record-breaking pace of 1956—when nearly $930,000,000 was invested in welding equipment, supplies and gases—it seems difficult to continue a program of setting sales records.

Yet that is just what is being done!

In the first quarter of 1957, welding sales ran approximately 12% ahead of those for the corresponding quarter in 1956. The second quarter was slower, but sales still remained slightly above the '56 level. In the third quarter, business was once again booming.

Billion-Dollar Probability

It still remains to be seen whether 1957 will be the welding industry's first billion-dollar year. But if sales continue as high during the remainder of the year as they have been to date, this dream should be an accomplished fact.

Welding's amazing growth—and its exciting prospects for '57—gives rise to the inevitable guessing-game: How much greater would our industry's gains be if it were *adequately* manned with the skilled craftsmen, technicians

Pure Nickel inner shell of 600-gallon steam jacketed kettle welded with Inco "61"* Nickel Filler Wire using consumable inert gas metal arc process and double "V" butt type welds. Fabricated by Toronto Coppersmithing Company, Limited, Toronto, Ontario.

For inert gas welding of high nickel alloys simplify your job with *specific* Inco wires

Choose from this full line of wires and rods:

For Monel* nickel-copper alloy—use Inco "60" Monel Filler Wire and Rod

For Inconel* nickel-chromium alloy—use Inco "62" Inconel Filler Wire and Rod

For "K" Monel* age-hardenable nickel-copper alloy—use Inco "64" "K" Monel Filler Wire and Rod

For Inconel "X"* age-hardenable nickel-chromium alloy—use Inco "69" Inconel "X" Filler Wire and Rod

For Nimonic nickel-chromium alloys—use Inco Nimonic* Filler Wire and Rod

For 70/30, 80/20, 90/10 copper-nickel—use Inco "67"* 70/30 Copper-Nickel Filler Wire and Rod

Inco "Sixty" series filler wires are produced in three diameters: .035", .045", and .062" and supplied on disposable spools for the consumable electrode process. "Sixty" series rods are produced in five diameters: 1/16", 3/32", 1/8", 5/32", and 3/16" and supplied in 36-inch cut lengths for the tungsten electrode process.

For a complete list of Inco welding products including specification data and recommended uses, write:

*Trademarks of The International Nickel Company, Inc.

The International Nickel Company, Inc.
67 Wall Street New York 5, N. Y.

INCO **Welding Products**
Electrodes • Wires • Fluxes

And remember: when you buy **Inco Nickel** you also get **Inco+Services.** Among them are included Fabrication Help, Field Information Centers, Convenient Sales & Corrosion Service and Technical Publications.

How the Welding Dollar was divided in 1956

FOR:	Total Industry	Arc Welding	Gas Welding	Resistance Welding
Arc Welding	27.0%			
Machines		21.8%		
Electrodes		57.4		
Accessories		9.2		
Argon & Helium		11.6		
Gas Welding	65.1%			
Oxygen			41.8%	
Acetylene			47.4	
Apparatus			6.9	
Accessories & Rods			3.9	
Resistance Welding	7.9%			
Machines				77.6%
Controls				9.4
Electrodes				13.0
	100%	100%	100%	100%

and engineers who are capable of using welding effectively?

Though the most acute shortage of welding personnel lies in the design and engineering field, skilled workmen are actually needed all along the line. Nearly 2,000,000 persons now make their living through the use of welding and related processes, yet newspapers in every industrial center carry daily advertisements sponsored by those still seeking weldors and welding supervisors.

The Research Department of WELDING ENGINEER, in its continuing study of the welding market and its compilation of industry statistics, is supplementing a project begun in 1955: a geographical determination of welding's use.

Results of this study, first announced a year ago, indicated that 80% of the welding market was confined to 13 states. These states, still the leaders, are:

Ohio	**10.64%**
Michigan	**9.70**
Illinois	**9.65**
Pennsylvania	**9.45**
New York	**8.88**
California	**7.54**
Indiana	**4.39**
New Jersey	**4.26**
Texas	**3.58**
Wisconsin	**3.57**
Massachusetts	**3.16**
Missouri	**2.63**
Connecticut	**2.27**

Following closely behind these states are Minnesota, Maryland and Iowa, which contribute another 5% to place 85% of the welding market within 16 states.

Metropolitan Area Study

In a further effort to pin-point the welding market, WELDING ENGINEER's Research Department is currently studying 168 leading metropolitan areas which account for 75% of the manufacturing employment in the U. S.

In the 241 counties being surveyed, there is an indicated sales volume of $650,000,000—*a figure which now represents 67% of welding industry sales!*

Cook County, in which lies the Chicago metropolitan area, is the nation's leading county in number of *metal-working plants* employing 20 or more workers. It is second only to Wayne County (Detroit), Michigan, in number of *workers* in plants employing 20 or more persons.

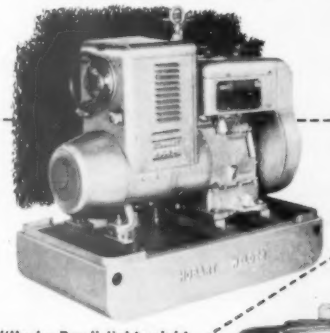
How Your Welding Dollar Was Spent

	1952	1953	1954	1955	1956
Arc-Welding Industry					
Machines	$ 41,604,065	$ 36,773,165	$ 33,043,167	$ 42,984,162	$ 54,589,837
Arc Electrodes	111,930,454	104,831,898	87,881,398	119,063,630	144,066,992
Accessories	16,487,983	15,984,221	15,009,431	17,934,761	22,987,623
Argon and Helium					29,267,730
Gas-Welding Industry					
Oxygen	119,276,095	139,187,436	123,949,000	162,932,174	252,766,844
Acetylene	205,328,703	229,842,689	198,369,000	261,419,570	286,874,321
Gas Totals	324,604,798	369,030,152	322,318,000	424,351,744	539,641,165
Apparatus	32,968,656	29,986,440	26,830,794	30,681,422	41,966,043
Welding Rod and Accessories	17,340,356	19,024,658	16,491,849	17,136,503	23,386,603
Resistance-Welding Industry					
Apparatus, Controls and Electrodes	$ 41,794,453	$ 38,153,601	$ 37,321,291	$ 50,312,245	$ 73,963,420

There's MORE actual profit for you when you use these new HOBART WELDERS with the built-in extras

Gas Engine Drive, 250 to 600 amp. capacity

Electric Motor Drive, 200 to 600 amp. capacity



"Husky Boy," lightweight, air-cooled, 200 amp. capacity

AC Transformer 180 to 500 amp. capacity

AC/DC Welder Combination

- It's the extra features you get with Hobart Welders that helps to cut your costs and boost the efficiency in your welding operations. A point for point comparison will quickly prove the added advantages you get for improving weld quality and speeding production. You'll like the simplified controls and ease of handling that make the new Hobart Welders so popular.
- Choose the right size and model for the job from the largest and most complete line of manual and automatic welders on the market today—AC, DC or AC/DC combinations—Gas, Electric or Transformers. Select the welder to fit your particular job and be assured of top performance that results in greater economy and faster more profitable production. Check the coupon for the latest specifications on the new Hobart Welders, no obligation.

HOBART BROTHERS COMPANY, Box U-107
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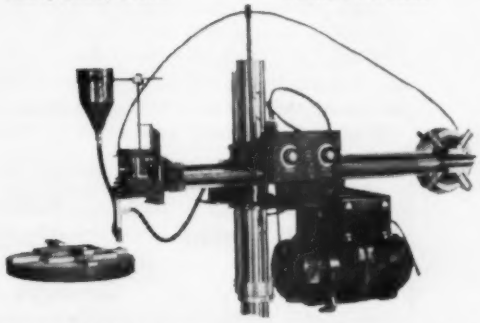
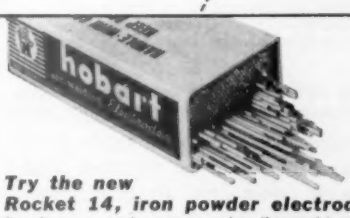


Automatic Welding Head has simplified controls for use with CV (constant voltage) welder. No costly, complicated installations.



Try the new Rocket 14, iron powder electrode!
Produce sound, strong, ductile welds. Weld with more speed, experience a new ease in handling. Ask for free catalog showing all of Hobart's "Quality Line" of electrodes.

HOBART BROTHERS CO., BOX U-107, TROY, OHIO, U.S.A.
"One of the world's largest builders of arc welding equipment"

To: HOBART BROTHERS *CO.*, Box U-107, Troy, Ohio
Send information, delivery, and prices on
_____Amp. capacity ☐ Gas Drive ☐ Electric Drive ☐ "Husky Boy"
☐ AC Transformer ☐ AC/DC Combination ☐ DC Rectifier
☐ Automatic Welders ☐ "Rocket 14" Electrodes

*NAME*_____
*ADDRESS*_____
*CITY*_____ *ZONE*_____ *STATE*_____

Steel Production in the U.S. 1941-1956

Ingots	Tons	Plates, Shapes & Sheets	Tons
1941	82,927,557	1941	23,342,334
1942	86,029,921	1942	27,488,389
1943	88,836,360	1943	23,219,605
1944	89,641,575	1944	23,498,712
1945	79,701,624	1945	24,681,737
1946	66,602,706	1946	21,396,280
1947	84,783,981	1947	28,492,386
1948	88,533,729	1948	29,215,509
1949	77,868,353	1949	21,670,929
1950	96,713,276	1950	26,983,427
1951	105,134,553	1951	30,826,444
1952	93,156,375	1952	25,498,190
1953	111,609,716	1953	26,889,093
1954	88,311,652	1954	28,002,100
1955	117,382,924	1955	36,097,565
1956	115,216,149	1956	31,430,662

Preliminary figures indicate that these two counties also represent the high spots in welding equipment sales.

Although there are over 225,000 manufacturing plants in the country, only the 23,000 which employ 20 or more plant workers are of prime interest in the welding field. This is the group which absorbs over 85% of welding industry products. Breaking this number down even further, we find that the 7,500 plants producing fabricated metal products are the largest purchasers of welding equipment and supplies.

No Output Gains

Industrial output of the nation's mills and factories have made no marked gains since the peak month of December, 1956. There are no signs that fourth quarter 1957 will change this situation with a sudden upswing in demand for manufactured goods.

As this issue goes to press, industrial output seems to be down about 1½%. The number of people engaged in manufacturing operations has also been cut about the same amount. However, the economic picture varies between industries, and the pattern of "ups and downs" will continue in the months ahead.

High prices which tend to discourage buying have contributed in some degree to production cut-backs. In addition, wage increases have hiked the cost of doing business, and manufacturers are finding it increasingly difficult to pass along their added costs in the form of higher prices.

Electrical machinery production is currently ahead of the corresponding period last year, but crude oil production is down. Manufacturers' backlogs of unfilled orders are continuing to decline, as they have in every month since last December.

Although orders for structural steel declined in July for the third straight month, steel production is still running about 2,000,000 tons ahead of 1956 during the first seven months of '57. This easing in demand for structural steel can mean that more steel fabricating plants will be able to obtain the scarce commodity—the shortage of which caused lay-offs in the welding trade early in 1957.

These factors are contributing to increased welding uses.

Heavy Argon Demand

Sales of welding gases are running ahead of last year. There has been a tremendous increase in the demand for argon—indicating more widespread acceptance of Tig (tungsten inert-gas) and Mig (metal inert-gas) welding processes.

Gases for Welding

Annual Production in cubic feet

	Argon	Acetylene	Oxygen
1952	153,403,000	5,963,801,000	22,814,299,000
1953	175,321,000	6,525,000,000	27,573,600,000
1954	186,197,000	6,197,000,000	22,073,600,000
1955	216,314,000	8,204,317,000	29,091,873,000
1956	325,187,000	9,254,000,000	31,602,000,000

Electrode production for the first eight months of 1957 is 2% behind the corresponding 1956 period. Mild steel electrodes are selling at a record pace, but alloy steel electrode production has dropped 40% behind 1956 levels and accounts for the 2% lag in the total electrode picture.

Welding machine sales, in terms of numbers, are definitely down. But machines now being sold are more elaborate, and result in an over-all increase in dollars received for such equipment so far this year.

Automatic welding equipment sales are now at an all-time high, as are the sales of positioners, turning rolls, and other devices which help automate welding processes.

Resistance Welding Boosted

Resistance welding sales for 1957, slowing down until recently, have received unexpected impetus from the automotive industry. Some auto manufacturers, in hopes of stimulating sales, have decided to make more extensive changes in 1958 models than were originally planned.

Auto production is off as much as 30% from high points registered in 1955. The same is also true of radio production and some kitchen equipment. Processing of primary metals, and production of heating, refrigeration and air-conditioning equipment, is down 10 to 20% from peak levels of recent years.

These facts and figures lead to one inescapable conclusion:

As the sale of welding equipment and supplies holds its own—or tends upward—while other major industrial fields report slackening production and sales, we are being given a priceless yardstick of the extent to which welding's labor and cost-saving possibilities are being recognized.

Electrode Production

	Pounds
1941	386,886,131
1942	745,893,457
1943	1,086,784,300
1944	847,937,972
1945	541,829,046
1946	340,029,320
1947	360,098,430
1948	436,359,255
1949	329,596,600
1950	422,287,900
1951	549,327,781
1952	573,376,722
1953	547,614,604
1954	431,263,875
1955	571,284,926
1956	637,576,092

Welding Wire Production

Electrodes and Wires	Pounds
1941	425,574,744
1942	803,755,822
1943	1,133,876,000
1944	890,243,721
1945	589,371,842
1946	370,632,958
1947	388,121,600
1948	467,986,321
1949	352,668,360
1950	450,848,053
1951	587,780,940
1952	607,496,832
1953	580,223,145
1954	460,942,721
1955	604,387,921
1956	677,058,075

How planned test procedures will help you

sell more welding -more profitably to a bigger market

MAGNAFLUX inspection of tractor parts, using Magnaflux KRH 3000 ampere unit.

MAGNAFLUX PRICES START AS LOW AS $195.00

Complete Kit F.O.B. Chicago

LIGHTWEIGHT MAGNETIC PARTICLE Y-5 YOKE KIT

PROVIDES PORTABLE INSPECTION

Easy to use, light-weight. Ideal for small pilot runs or sampling. If you have a larger Magnaflux Unit, the Y-5 Yoke provides extremely convenient on-the-spot testing.

ZYGLO Portable Kits (for nonferrous metals)

start at $125.00 F.O.B. Chicago

MAGNAFLUX Systems are available in all sizes and capacities, up to conveyorized, automatic units for inspection at the rate of thousands of parts per hour.

THE HALLMARK OF QUALITY IN NONDESTRUCTIVE TEST SYSTEMS

Most welding authorities agree that the most profitable opportunity for welding today is to extend its use as a fabrication method. If this lines up with your thinking, Magnaflux Test Systems can help you do it—with a practical, proven 4-point program.

1. Design for welding

With good stress engineered design welded fabrications are easier and more economical to produce. Good design establishes specifications that meet true service needs, at reasonable cost.

Right here, stress analysis with Magnaflux Stresscoat brittle coatings can eliminate guesswork and wasted effort. You'll save money, and be assured of a sound yet economical product.

2. Establish consistent standards

Determine the service level required, establish a standard and hold to it. When your customers (or engineers) *know* they are sure of welding adequate for the requirements, they can often design functionally better parts at lower cost. *Result: they use more welded fabrication.*

Magnaflux Test Methods find all defects in welds that need to be found, in both ferrous and nonferrous metals, with any sensitivity level called for. In practice, this means lower costs, less rework or repair.

3. Control your operators

Magnaflux Test Systems can provide a simple, continuous check from the stringer bead to the finished product. Quality goes up because you can spot trouble fast and correct its cause. *You save wasted effort, man time and materials.*

4. Capitalize on your testing

"Tested by Magnaflux" is generally accepted as certifying that welded fabrications are fully reliable for the service intended. *This is a powerful tool for creating new uses and markets.*

Want more evidence?

Then ask to have a Magnaflux Field Engineer give you facts and figures on how Magnaflux Test Systems can help your company to sell more welding, more profitably, to a bigger market. Write or call for a meeting. No obligation of course.

MAGNAFLUX CORPORATION

7342 West Lawrence Avenue
Chicago 31, Illinois

New York 36 • Pittsburgh 36 • Cleveland 15
Detroit 11 • Dallas 19 • Los Angeles 22

Indecisive?

Don't hold the bag —use welding!

By Len Kull
Advance Metalworking Co.
Kewanee, Ill.

A BAGHOLDER company in Illinois found that it was left holding the bag when prices shot up.

Redhead Bagholder Corp., Princeville, Ill., found the cost of its product —holders which keep the mouths of bags open while they are being filled —mounting steadily. Our firm took over the task of redesigning the holder and producing it.

A study revealed that no serious problems were encountered with bases which were cast—other than breakage in transit. However, foundry charges were mounting alarmingly, deliveries tended to be slow, and drilling and tapping on the cast bases were burdensome.

Welding Applied

It was decided to weld bases in the interests of economy, appearance, strength, and lighter weight. The design had to be simple since no elaborate equipment was available for forming, cutting, bending, or embossing steel parts.

Burlap bags are supported on an adjustable platform of the holder. A socket and set screw hold the platform to the main column of the machine, which is placed in a socket on the larger main base. At the top of the column is an arrangement of spring, arm, and jaws which hold the bag open.

Designers tackled the requirements. Their answer included only five pieces for the platform and eight for the main base. The platform consists of an 11 by 12-in. flat plate, 10 gage steel, with front rounded corners. An edge strip ¾-in. deep by ⅛-in. wide is welded to the underside of the plate.

A socket is cut to 2⅛-in.-length from 1½ in. square tubing. A socket reinforcement is added to this in the form of a 90 deg angle bent from ¼ in. bar stock. A support bracket of triangular shape is used to mount the socket slightly above and to the rear of the plate.

A series of ten ⅛ in. fillet welds, ½-in.-long, fasten the edge strip to the plate. The welds are equally spaced around the periphery. The firm found short welds prohibit distortion while welding light gage material and yet provide ample strength.

Socket Reinforcement

The 90-deg socket reinforcer is also fillet welded. The support bracket, with its reinforcement, is, in turn, welded to the plate. As the last step, all exposed edges are deburred.

Main base is cut from 17 by 18 in. plate. The rear edges taper from the center, presenting two 9 by 3 in. triangular sections. These sections are used as gussets to be welded on both sides of the socket and to the plate.

The socket itself is formed from two 1¾ by 1¾ in. angles of ¼-in. bar, 2⅛-in. long. Welded together with a 3/16-in. fillet, they form a square. An edge strip is welded around the plate as on the bag platform.

Added solidity is given by diagonal and transverse reinforcing strips tack welded to the bottom of the base. These are ⅛ by ⅝ in.

The figures below give a comparison of cost and weight in the cast form of the holder and in its new, welded form.

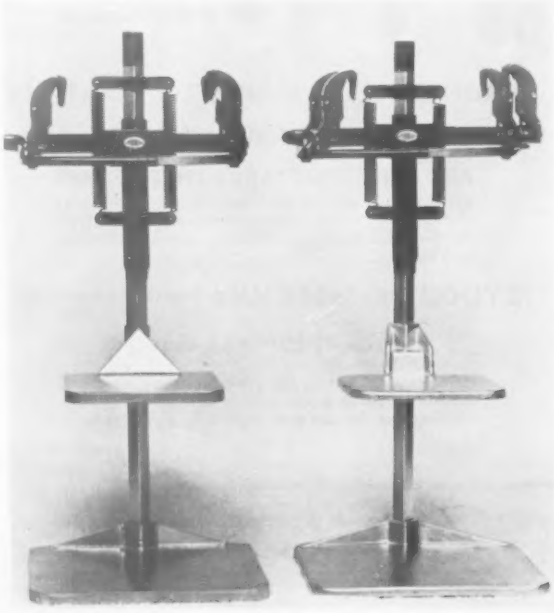
	Main Base		Bag Base	
	Cast	Welded	Cast	Welded
Weight, lbs.	22	15	14	8.5
Cost Index	168	100	149	100

Gains Realized

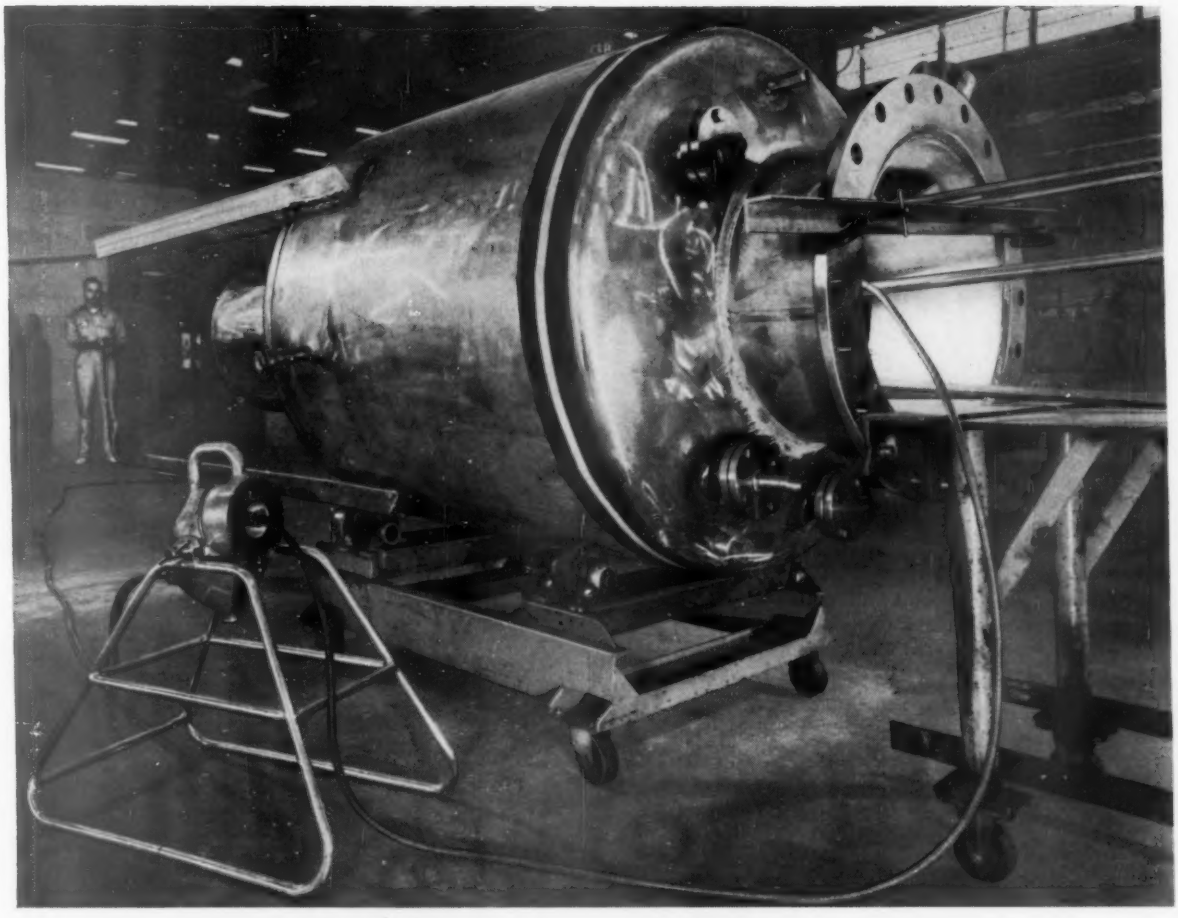
Percentages taken from above indicate that 32% of the weight was cut in the main base and 49% in the bag base. In cost, welding showed a 68% saving over casting in the main base and 49% in the bag base.

The appearance of the welded product is equally as attractive as the cast version, yet offers more strength. The last part of the problem—delivery—was also expedited.

The weldments were originally jobbed out. Later, however, the firm purchased a 250-amp Lincoln Electric Co. generator and moved the job into Advance Metalworking's plant.



DIFFERENCES between bagholders are clearly demonstrated. Notice cleaner appearance of welded platform and base. Firm found welding ranked far above casting.



OAK RIDGE NATIONAL LABORATORY USES NUCLEAR SYSTEMS' RADIOGRAPHY MACHINES

The Oak Ridge National Laboratory, operated by Union Carbide Nuclear Company for the United States Atomic Energy Commission, is using radiography machines developed and manufactured by Nuclear Systems, a division of The Budd Company, for their atomic research activities.

Shown above is an operator using Nuclear Systems' Model 30, checking a circumferential weld on a fabricated stainless steel pressure vessel, an evaporator used for waste disposal processing of radioactive materials.

Within 10 minutes the operator can make an *internal* exposure of a complete circumferential weld, using iridium 192.

Weighing only 55 pounds, the Nuclear Systems' radiography machine Model 30 is ideally designed for portability and in-shop exposures.

NUCLEAR SYSTEMS
A DIVISION OF THE BUDD COMPANY, Philadelphia 32
Budd

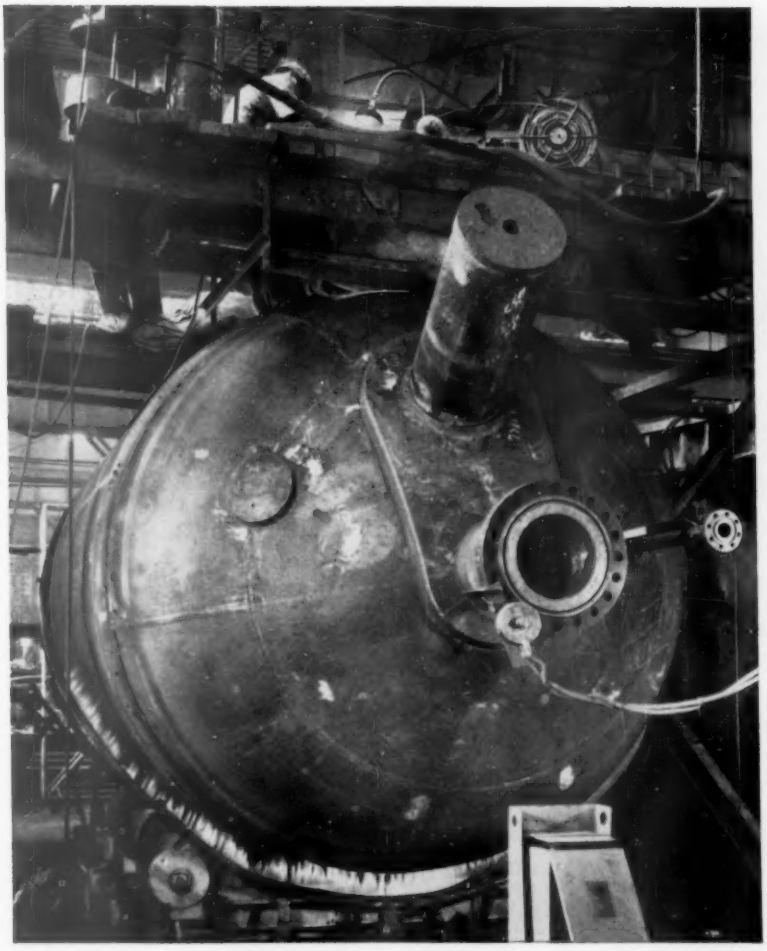
BY hardfacing this gear, a manufacturer hopes to add 3,400% to its lifespan, reports Wall Colmonoy Corp. Before hardfacing, no gear lasted longer than 140 hours in ball mill operations—after hardfacing, one has been at work for 1,760 hours. The firm is now shooting for the 5,000-hour mark.

MOTORISTS in Washington, D. C., are being startled these days as this "Weldmobile" flashes by, headed for a job. Built from a 1952 Crosley truck by Delotcha Butler, it mounts a 200-amp welding machine and gas welding equipment.

On the job . . .

"WHAT welding has joined together no man can put asunder," may be the thought of this technician as he adjusts controls on an automatic submerged-arc welder which joins guided-missile air tanks. Consumable weld inserts, manufactured by Arcos corp., save weight and give X-ray quality on the work. Research Welding & Engineering Co., Compton, Calif., finds inserts permit faster one-side welding.

UNLESS a man was present to serve as a scale, it would be difficult to judge the size of this welding fitting. Actually, it is the largest aluminum tee ever forged—24 by 18 in. Produced by Tube Turns for the AEC in Oak Ridge, it will be used as part of a research reactor. This is the first major use of aluminum for main reactor coolant lines.



When fabrication codes demand 100% X-ray inspection...

SPECIFY *Drawalloy* CORPORATION

Stainless Steel Welding Wire

In hundreds of applications, *Drawalloy* wire has been put to the test . . . X-ray, dye check, pressure and service and with the same consistent result—OK as welded. That's why Frank Iapalucci, Manager of Welding Engineering for Baldwin Lima Hamilton, Eddystone, Penna., selected *Drawalloy* chrome-moly wire for the automatic welds on this reactor. The vessel is constructed of A 301-54T Grade B firebox quality steel ranging in thickness from 5-1/16″ to 2-5/8″. *Drawalloy* 1-1/4 Cr, 1/2 Mo wire was used for all submerged arc joints.

When inspection by X-ray is required, don't gamble . . . rewelding is expensive . . . specify Drawalloy "quality controlled" wire. *Drawalloy* stainless steel welding wire is produced to strictly controlled specifications to provide the right chemistry, finish and temper for smooth operation in your equipment and to provide X-ray quality welds.

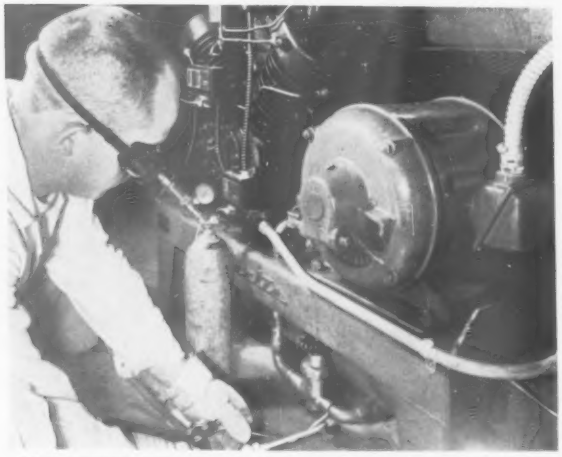
Why not discuss your stainless welding wire needs with your *Drawalloy* Distributor or Representative . . . a man ready to help you. Bulletin 355-DC provides complete information on every grade of *Drawalloy* wire. Write to: Drawalloy Corporation, Lincoln Highway West at Alloy Street, York 12, Pennsylvania.

DRAWALLOY
CORPORATION
YORK, PENNSYLVANIA

THE WIRE MILL FOR THE WELDING INDUSTRY — STAINLESS STEEL · HARD SURFACING · TOOL STEEL

new products . . . . . USE CARD ON PAGE 121

CONTOUR sanding requires that the end of the wheel be in contact with a flush surface. Here the small "PG" wheel fits the curve of the area being finished. ***(See story below.)***



LIGHTWEIGHT air-acetylene torch can be used for soldering, light brazing, leading, thawing. It was designed for refrigeration and air-conditioning work, plumbing, etc. ***(See story below.)***

Polishing wheels

FLUSH sanding is possible with a new line of small coated abrasive polishing and grinding wheels which feature disposable flanges. The factory-installed, bonded-to-the-core flanges lock the wheel's coated abrasive leaves securely in place, making it unnecessary to remove flanges when a wheel change is needed. Just slip the "PG" wheel on the spindle and tighten the cap nut, the manufacturer instructs, adding that performance and prices are not affected by the improved design.

Flanges are recessed into the side of the wheel. With the end cap nut recessed, the wheel can be used flush against a surface, as in finishing a right angle or corner. Recessed flanges are available on all diameters of the small (6 in. through 10 in. diameter) wheel line, and on widths 1½ in. and up.

With the new adapter kits designed for use with flange-type wheels, they fit onto any portable tool or bench lathe. *Minnesota Mining and Mfg. Co.*

Circle No. 1

Vacuum chambers

CAPABLE of ultimate vacuums of better than 10^{-5} mm Hg and available in both standard "packaged" or specialized designs, controlled-atmosphere vacuum chambers are used for research and production welding, casting, and metallurgical research on such metals and alloys as titanium, zirconium, Zircalloy —2, hafnium, molybdenum, etc.

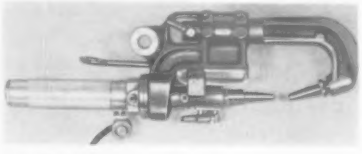
Model Vc-32 is typical of the standard packaged unit. Tank and end bells are stainless steel; tank capacity is 32 cu ft with clear inside dimensions of 29⅞-in. diameter and 54½ in. length. Glove and view ports are provided on each side. Shipped complete with vacuum pump and control console, welding power source and welding jigs and fixtures. *L & B Welding Equipment Inc.*

Circle No. 2

Burn spray

MINOR burns can be treated with new aerosol spray containing Allantoin, an ingredient which stimulates healing, manufacturer says. Cost: $1.49. *Interstate Precision Products Corp.*

Circle No. 3



Portable weld guns

COOL operation is a feature of a new line of portable welding guns. Manufacturer claims that you can hold your hand on the jaw extension, right below the point. This cooling is the result of eliminating the usual integral cast water line. Instead, the incoming water reaches the welding point through a tube insulated almost its entire length.

New guns come in complete line including C type and scissors type with either upper or lower jaw operating. *Allied Welder Corp.*

Circle No. 4

Soldering kit

READY to attach to any acetylene tank and go to work, new "Handi-Heet" soldering torch kit is designed especially for refrigeration and air-conditioning work, plumbing, auto-repair, etc. Torch can be used for soldering, light brazing, leading, thawing. Complete units with preset regulator available to fit commercial tanks, and styles "B," "P.O.L.," and "MC" tanks.

Flexible "O" rings form a gas-tight seal between tip mixing section and torch head. Within each tip is an individual mixer that adds correct amount of atmospheric air to acetylene to give desired flame. Wide range of flame variation provided in each tip by leak-proof needle valve.

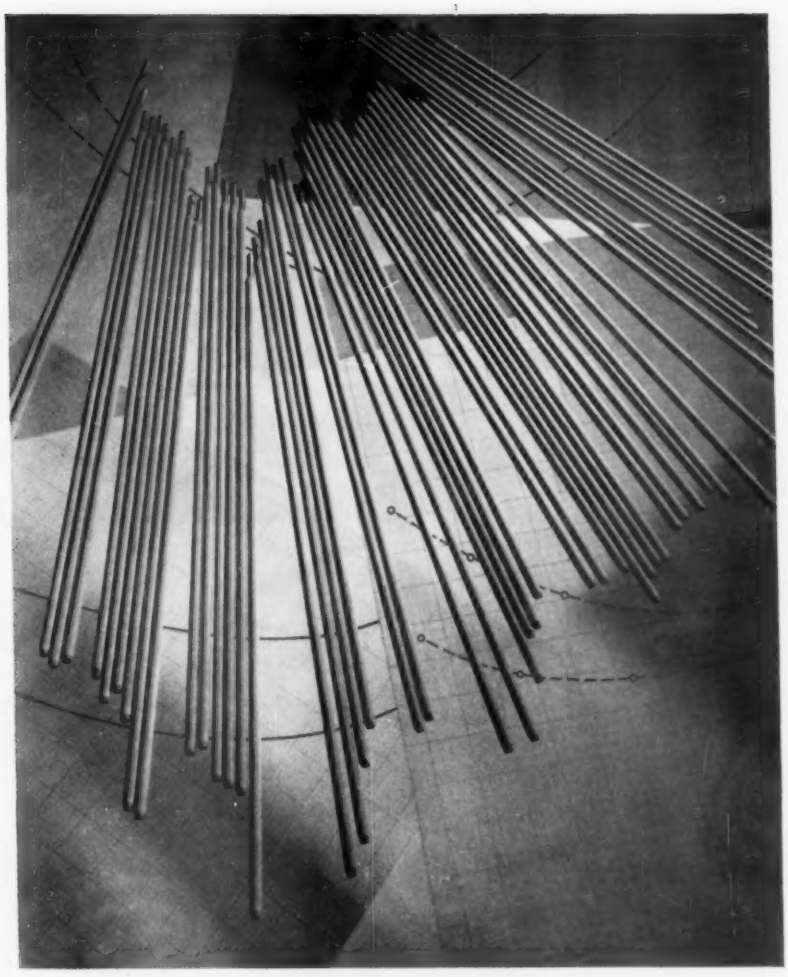
Six tips available to handle jobs from jewelry work to fast paint burning, heavy soldering and heating. Soldering iron assembly is available for soldering seams, connections, splices and tinwork. *Smith Welding Equipment Corp.*

Circle No. 5

Air control valve

STUDIES of dirt, grit and abrasives settling around the pilot valve stem led to development of a new series of pilots with small synthetic rubber boot which snaps in place around the valve stem, sealing all critical parts from dirt and abrasives. Aluminum, stainless steel and molded nylon used extensively to give valve longer service by providing resistance to corrosion. *Hanna Engineering Works.*

Circle No. 6



NAME THE PROPERTIES you want in welding rod coatings

...and Foote *will supply the raw materials!*

Welding Rod Coating Formulations can get rather complicated! But if you're using FOOTE RAW MATERIALS in your formulations, you have a head start on getting just the right combination of properties you require.

In the application of coating formulations to welding rods, Foote raw materials give coatings smooth-flowing extrudability, rugged green strength, and crack-free drying characteristics.

In the performance of coating formulations in actual welding, these materials produce high alloy efficiency, steady arc action, good slag characteristics, proper deoxidation, and efficient metal deposition.

For these coating properties and more, specify Foote Alloying Materials, Arc Stabilizers, Fluxes, and Slag Forming Materials. Write for our informative brochure, entitled "Raw Materials For Welding Rod Coatings". Address request to Technical Literature Department, Foote Mineral Company, 453 Eighteen West Chelten Building, Philadelphia 44, Pa.

Foote MINERAL COMPANY

Pioneer in the manufacture of welding rod coating materials

RESEARCH LABORATORIES: Berwyn, Pennsylvania

PLANTS: Cold River, N.H.; Exton, Pa.; Kings Mountain, N.C.; Knoxville, Tenn.; Sunbright, Va.

WELDING GRADE FERRO ALLOYS • LITHIUM METAL, CHEMICALS, MINERALS • STRONTIUM CHEMICALS • ELECTROLYTIC MANGANESE METAL • STEEL ADDITIVES • COMMERCIAL MINERALS AND ORES • ZIRCONIUM, TITANIUM, HAFNIUM (IODIDE PROCESS)

HIGH PRODUCTION RESISTANCE WELDING
DELTA
WELDER CORP.
MACHINES AND EQUIPMENT

High production resistance welding equipment and automation devices . . . designed, engineered, and manufactured by Delta Welder . . . that's the "know-how" which assures lower production costs and improved product quality!

The record of outstanding performance compiled by Delta Welder equipment and automation devices is worth your examination.

Permit our sales engineers to show you Delta Welder equipment developments and machines that are saving time and money for nationally known manufacturers. Write or call. No obligation. Ph. Texas 4-8446.

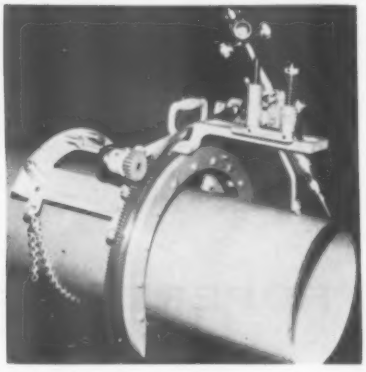
DELTA WELDER CORPORATION
8525 Livernois • Detroit 4, Michigan

Brazing alloy

MADE under controlled atmospheric conditions, alloy 1200 is 6% silver, 7¼% phosphorus and has copper balance. Gives fast capillary action and is ductile. Can be used on copper, brass, bronze or other copper bearing alloys. Melts at 1,185 deg, flows at 1,200 deg.

Alloy 1220 has same silver content as 1200, but less phosphorus to enable the rod to build up larger fillets in the joint. It is more ductile, but not so free flowing as 1200. *Alloy Specialties Co.*

Circle No. 7



Cutting attachment

"OUT - of - Round" attachment for standard pipe cutting and beveling machines works on the spring-tension principle. Spring and a roller rod assembly are the two main components of attachment. Special attachment is engineered to eliminate the problem of inaccurate cuts or bevels on "out-of-round," or imperfect pipe.

Assembly consists of rod fastened to the body of the attachment with a set screw arrangement, and a small diameter wheel affixed to the end of the rod travels the outer circumference of the pipe surface. Through the action of the spring, constant pressure is applied to the roller rod, which forces the wheel to follow the contour of the pipe. This maintains the torch equidistant from the pipe, correcting any defects in the surface. *H&M Cutting & Beveling Machine Co.*

Circle No. 8

Alloy

SOLDER-type alloy is ideal for joining dissimilar combinations of steels, copper and nickel alloys. Metals include steel, stainless steel, copper, brass, bronze, Monel and Inconel. Application temperature range is low 400 F to 500 F. *Eutectic Welding Alloys Corp.*

Circle No. 9

Double welding production...cut handling costs in half with P&H Welding Positioners

Just imagine — the push of a button doubles your welding production and frequently cuts the cost of handling weldments in half! These welcome savings can be *yours* if you use P&H Welding Positioners.

P&H positioners enable the operator to position weldments with fingertip ease for comfortable downhand welding. There's no waiting for cranes, hoists, or extra help. What's more, P&H positioning is quick and safe — frees the operator for welding.

Downhand welding, *the natural way*, permits the use of larger, hotter rods for faster deposits. Because metal pools more evenly, welds are stronger and cleaner.

P&H positioners provide 360° rotation, full 135° tilt, and 50% greater elevation than any other make. Capacities up to 100,000 lbs. For complete information, write Dept. 328B, Harnischfeger Corp., Milwaukee 46, Wisconsin.

HARNISCHFEGER

P&H WELDERS • ELECTRODES • POSITIONERS

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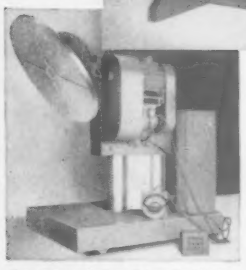
Offers You Over 200 PROVEN Standard Stock Models of Quality POSITIONERS "POSITIONEERED" to your exact Requirements

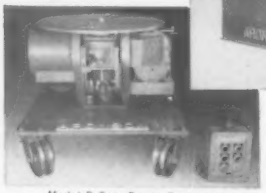
Patented

Aronson TracTred (T. M. Reg.) Turning Rolls for thin-walled heavy cylindrical work to 27 tons capacity. Zero to 100 IPM turning speed and Built-In Grounding.

Heavy Duty Precision Built Rubber and Steel Tired Turning and Pipe Rolls, 100% overload protected. Capacities to 300 Tons.



Heavy Duty Gear Driven Positioners, with Magnetic Braking, Mercury Grounding, and Optional Speeds. Capacities to 120,000 lbs.



Heavy Duty Floor Turntables with precision speed control and Magnetic Braking, used for welding, burning, X-raying, etc. Capacities to 120,000 lbs., various heights and speeds.

Fully Automatic Gear Driven Positioners, featuring Power Elevation, Tilting and Rotation. Capacities to 120,000 lbs.

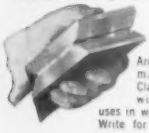
Model D Gear Driven Positioners. Compact, Precise, Rugged. Capacities to 1000 lbs.

Bench Turntable Automatic Positioners with Mercury Grounding Capacities to 500 lbs.

Patented

Aronson Universal Balance Positioners (T. M. Reg.) position your weldments effectively, instantly for downhand welding. Capacities to 2000 lbs.

Rugged Head and Tail Stock for positioning bulky weldments between centers. Table Backup for Zero Deflection, Magnetic Braking. Capacities to 160,000 lbs.



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Write for detailed engineering data

Quality POSITIONERS by Aronson MACHINE COMPANY
ARCADE, NEW YORK

Salamander

LP-GAS salamander Model SLP has triple burners for complete combustion of gas. It eliminates smoke and soot, makers claim. Equipped with a 10-in. cast iron deflector and safety shut-off for unattended operation, it will operate on 11 in. WC pressure. Model SVP will operate on tank pressure and incorporates a twin burner principle. *Wemco Products.*

Circle No. 10

Heating element

DOWNTIME is reduced with a new carbide heating element which can be installed in a hot furnace. It can be used in periodic or continuous applications requiring temperatures up to 2,800 F. *Carborundum Co.*

Circle No. 11

Sandblast nozzles

"JET-STREAM" sandblast nozzles are manufactured in three styles and five sizes. They are designed for use in industrial cleaning and finishing. *Diamonite Products Mfg. Co.*

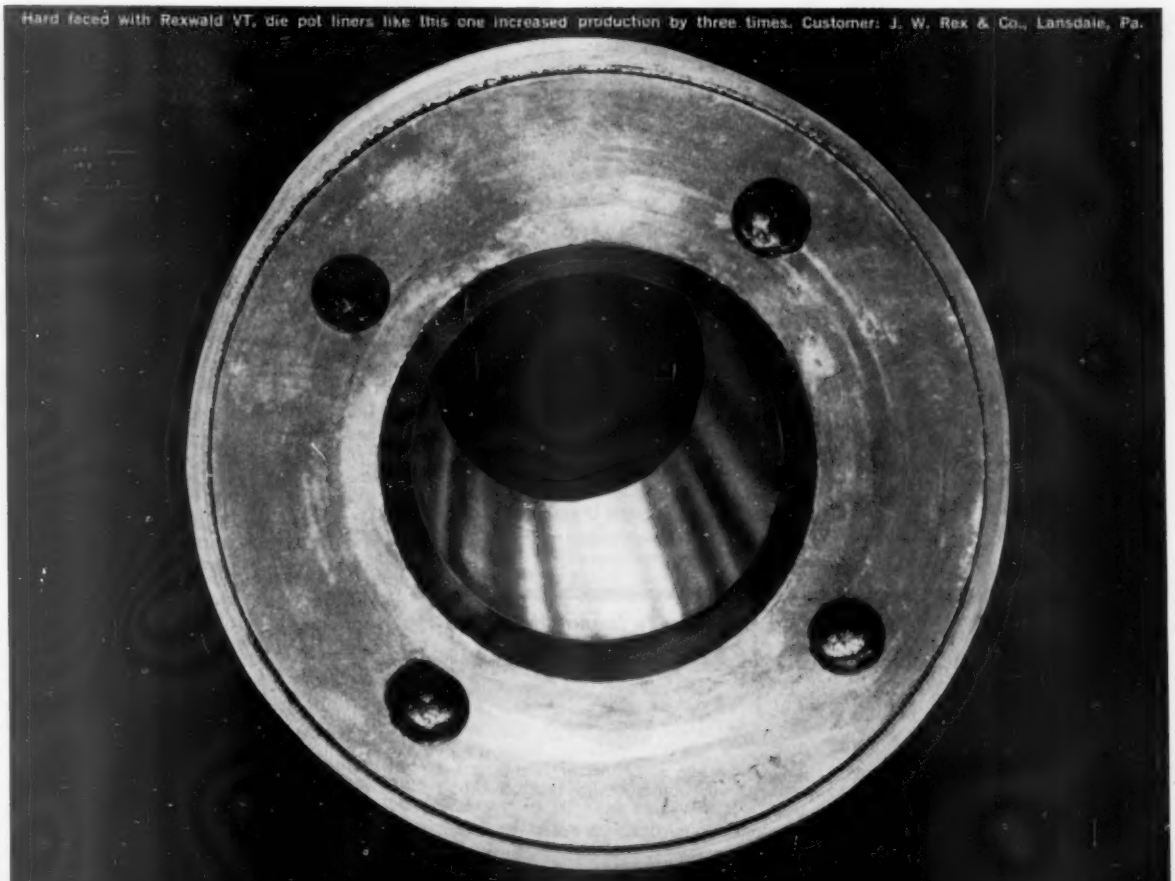
Circle No. 12

Safety goggles

"SOFT Sides" are new feature on flexible safety goggles with three types of ventilation. Of tough, flexible vinyl with a cellulose acetate replaceable lens, goggle has extra wide frame and fits over personal glasses. Extra nose flange gives extra protection. Model 810 is perforated ventilation style, Model 811 offers screen ventilators and Model 812 has indirect air-vents.

Patented lens replacement and lens retaining channel running around frame are new features. Lens has six opposing tabs to hold it within the channel during use. By flexing the frame at tabs, the lens can be quickly removed. *Sellstrom Mfg. Co.*

Circle No. 13



Hard faced with Rexwald VT, die pot liners like this one increased production by three times. Customer: J. W. Rex & Co., Lansdale, Pa.

Rexweld VT yields three times the forgings of best competitive alloy

In tests to determine which hard facing material yields the greatest number of forgings, one user reports that Crucible Rexweld VT outperformed the next best competitive alloy by almost three to one. They are now using Rexweld VT to rebuild and protect crucial die pot liners, like the one shown above, that is used to forge heavy shells for the Navy.

The tests illustrate many of Rexweld's superior properties: Higher resistance to thermal shock . . . Higher red hardness above 1600F . . . Measurable elongation up to 5%. These are reasons why Rexwelded dies have higher strength, and resist chipping, deformation and heat checking.

Rexweld hard surfacing rods are available in both bare and low hydrogen coated electrodes, in a wide variety of sizes and grades. Your local Crucible representative can give you more information on how Rexweld helps increase production, lower down-time, and cut manufacturing and maintenance costs. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

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for SAFETY • SPEED • ECONOMY

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EXCLUSIVE CAM-ACTION
Fibre Insulated
CABLE CONNECTORS

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- Lock tight—stay tight—release easily.
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cam-lok *Neoprene Insulated*
CABLE CONNECTORS

- Eliminate cable breakage at connector. Cable jacket cannot pull away. Connection smoothly tapered—won't be caught on obstructions.
- Minimum resistance when locked, yet quick disconnect. Connects all cables, #2—4/0.
- Sleeves are permanently vulcanized to cable jacket with Vulcanizing Kit.

Quickly producing vulcanized economical CABLE SPLICES AND CONNECTORS *without power loss*

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- Produces a neoprene insulated cable Splice or Connector in 5 minutes, in 5 easy steps.
- Waterproof and shockproof connection . . . conductivity and insulation equal to new cable. Kit operates on 110 V. AC.

Making economical, vulcanized CABLE SPLICES *in minutes*

cam-lok *Neoprene Insulated*
CABLE SPLICES

- Each Splice is uniformly smooth . . . permanent . . . waterproof . . . safe . . . delivers full power.
- Economical . . . you can splice as little as two, 2' sections together economically, which might otherwise be wasted.

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Nov. 4th-8th

Titanium positioner

TO MATCH latest processes in welding of titanium, Model 21TS is a fully automatic positioner called "Titanium Special." It has a gastight seal plate under the 60-in., round, 8-slot, precision machined table. The seal plate is 64 in. wide. The plastic gastight dome can be placed over the table and workpiece to weld in a gaseous atmosphere.

Positioner features controlled rotation at variable speed and fast positioning, powered tilting and powered elevating—all pre-set in electrical panel. Electric tachometer with 7 in. dial, accurate to 2%, reads rpm table speed setting of transmission, with or without the table turning, so weld speed can be pre-set. Rotation motor and transmission are clutch-brake equipped.

Operator controls are on 110-v control circuit. Load capacity is 5,000 lb. The heavy duty steel base is equipped with 8 in. heavy-duty vee-groove casters, two swivel and two rigid for portability. *Aronson Machine Co.*

Circle No. 14

Weld roll planisher

AUTOMATIC weld roll planisher is especially suited to manufacture of water heaters, water softeners, containers, tanks, tube and pipe. It cold rolls and flattens flash welds, resistant welds and fusion welds under controlled pressures up to 10 tons.

Model No. 47560 will receive, planish and eject a 52-in. long shell in 18 seconds. Automatic carriage is readily adjustable to various diameters. It receives the shell from the transfer line, carries it into pressure rolls and ejects it automatically. *Airline Welding and Engineering.*

Circle No. 15

Plant, Research Laboratories and World Headquarters

BETTER FASTER

Low Temperature EUTECTIC WELDING ALLOYS

STRONGER WELDS

EUTECTIC Welding News

PUBLISHED BY EUTECTIC WELDING ALLOYS CORPORATION, 40-40 172 STREET, FLUSHING 58, NEW YORK, N. Y.

OVERLAY TECHNIQUE SAVES $2000

Photo shows hammer heads in various stages. Far left shows new hammer. Others show cracking and peeling to different degrees. These were overlayed with ordinary materials.

Overlaying worn crusher hammers with conventional welding materials proved costly to a Minnesota brick plant. Overlays failed in less than a week, repair costs mounted.

The Eutectic District Engineer advised that high heat needed to apply the conventional materials actually weakened the overlay. The answer was to use as low amperage as possible.

Tests were run on hammers rebuilt in this way: First, hammer faces were padded with EutecTrode 680 AC-DC. This very high strength alloy, applied at very low amperage, acts as a cushion for the overlay. Next, EutecTrode 10 for super high hardness (RC 64-68) was applied over the padding layer, giving maximum abrasion resistance. For added protection against severe pounding. EutecTrode 12 was applied to corners.

At the start of the test, all hammers weighed 21½ pounds. After two weeks hammers with conventional overlays were down to 16¾ pounds. Six weeks later hammers with Eutectic repaired overlays were still 18¾ pounds. Repairs, reports the company, which once cost $690 every six weeks, were now reduced to $369... savings close to $2,000 a year... almost 50%. Now, hammers need attention only every six weeks rather than every week... and downtime has been cut by 84%. ***(B-13)***

EXTRUDED COATING SOLVES ALUMINUM WELD PROBLEM

Welds on aluminum tanks were cracking right down the middle. Difficulty was caused by the uneven flow of flux, common when flux is put on rod by old fashioned dipping. Eutectic's Low Amp EutecTrode 2101, with *extruded* "frigid arc" flux coating was used. Because of smooth, even, *extruded* application of flux to rod, it is spatter-proof and easy to control. EutecTrode 2101 is strong, too—with an ultimate tensile strength of 34,000 psi to make joints up to three times stronger than those obtained with conventional welding materials. Tank fabricator reports cracking problems solved...production increased by 40%. ***(B-14)***

CONCRETE FORM'S INTERIOR BRACING WELDED WITH SUPER-STEELTECTIC 110

An Illinois welding shop received an order for six concrete septic tank forms. Welds on this job were in all positions, and interior bracing consisted of heavy angles set against sheet steel. Using conventional mild steel electrodes, weldors soon ran into difficulty. Many angles and braces made the arc hard to maintain, and the deposit could not be properly controlled for the strong welds needed.

Super-SteelTectic 110, a new universal, all position EutecTrode was suggested by the Eutectic District Engineer. The highly exact control of penetration possible with this alloyed steel electrode gives excellent results on joints of varying thicknesses. The lower amperage minimizes danger of burn through, and eliminates spatter. Welds are exceptionally strong, too, as Super-SteelTectic 110 deposits weld metal near 110,000 psi tensile. ***(B-15)***

Q. We have a bulldozer drive shaft, 3⅝ inches in diameter, that sheared in half. What repair procedure is recommended?

A. Vee the shaft out on either side of the break and clean thoroughly. A square butt joint is not recommended. High strength patented EutecRod 16FC, 3/16-in diameter should be used together with Eutector 16B Flux, which is painted on prior to heating. Joint should be designed with a gap to insure deposited metal throughout.

Q. Our flux for stainless steel brazing breaks down at about 1700°F. What can you recommend?

A. The "Eutector" series of T (Triple Strength) fluxes is designed for applications requiring sustained heating cycles or higher temperatures than are normally used in silver brazing. Consequently, the T fluxes are suitable for temperatures up to approximately 2000°F.

Q. In production of surgical instruments we have been using a conventional silver alloy that tarnishes badly. Require a thin flowing silver alloy of the same melting temperature that will retain luster.

A. EutecRod 1800 is free of cadmium, the element most responsible for tarnishing. Bonding temperature is approximately 1100°F. EutecRod 1800 is of the eutectic-type, having a narrow plastic range, and noted for its thin flowing properties.

Eutectic Welding Alloys Corporation
40-40 172nd Street, Flushing 58, N.Y.

Gentlemen:

I would like further free information on the following:

☐ B-13 ☐ B-14 ☐ B-15

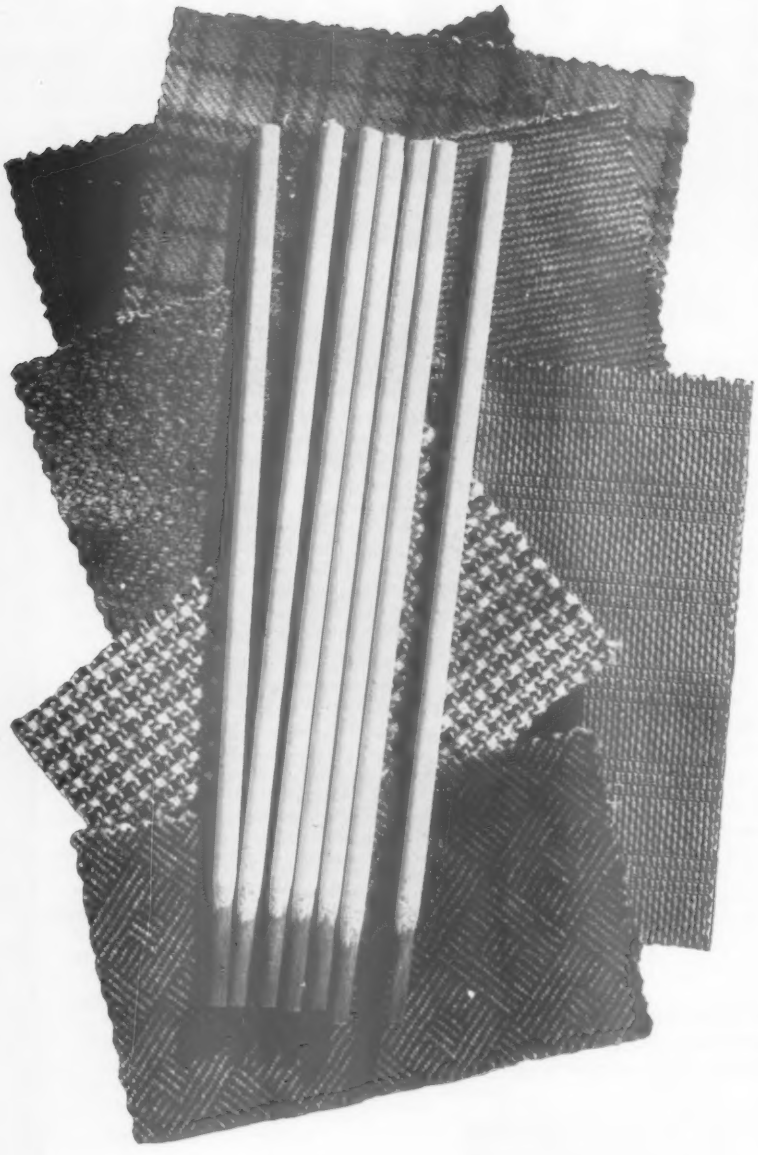
☐ Free: New 1958 180 page pocket Welding Data Book.

Name_____

Business Address_____

City_____ State_____

"EUTECTIC" WELDING HEADLINES • TIME-MONEY-MACHINERY SAVERS



Rod performance is **IN THE COATING**

COATING FORMULATIONS are the key to electrode performance. When RUFLUX* is used in the coating, it provides several important advantages. The particular advantages depend upon which RUFLUX* products are used.

Manufacturers look to TAM for three types. They are the highest quality Rutiles, Titanates and Zirconium compounds. A TAM sales engineer can give you the facts on any one quickly and accurately while a request to our NYC office will bring you detailed literature.

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*Reg. T.M.

Weld control

POSITIONER control is for use with automatic fusion welding machines. Permits operation of welding positioner. Control has regulated d-c motor control for positioner rotation, ½ hp 203 frame d-c shunt wound motor, electric clutch-brake, accessory panel with a-c reversing motor starter for table tilt, electric clutch-brake control, limit switch circuitry to customers specifications, etc. *Weltronic Co.*

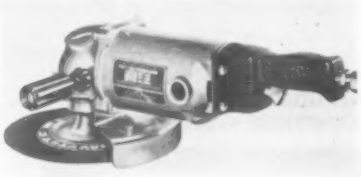
Circle No. 16

Electrode

WITH 110,000 psi, for arc welding on mild steels and high strength, low alloyed steels, a new electrode is especially effective on thin and dissimilar gages with highly critical joints. Recommended for fabrication of high strength piping and tubing in flat, horizontal and overhead positions.

At low amperage electrode can be used on thin walled tubing, sheet metal and poor fitting joints. At upper range, it is very effective on structural steel welding of heavy plate, framework, angle and beams. Coating is designed to give weldor some control over arc drive, penetration and deposit buildup. Available in 3/32, ⅛, 5/32 and 3/16 in. diameter sizes. *Eutectic Welding Alloys Corp.*

Circle No. 17



Grinder

PORTABLE grinder weighs 14 lb and is made for use with 9-in. disc wheels and 7-in. cup wheels. For normal operation, the 2-hp 115-v motor uses only 60% of its power. All parts are rust and corrosion-resistant. The grinder features "Klixon" automatic reset overload protector. *Vee-Arc Corp.*

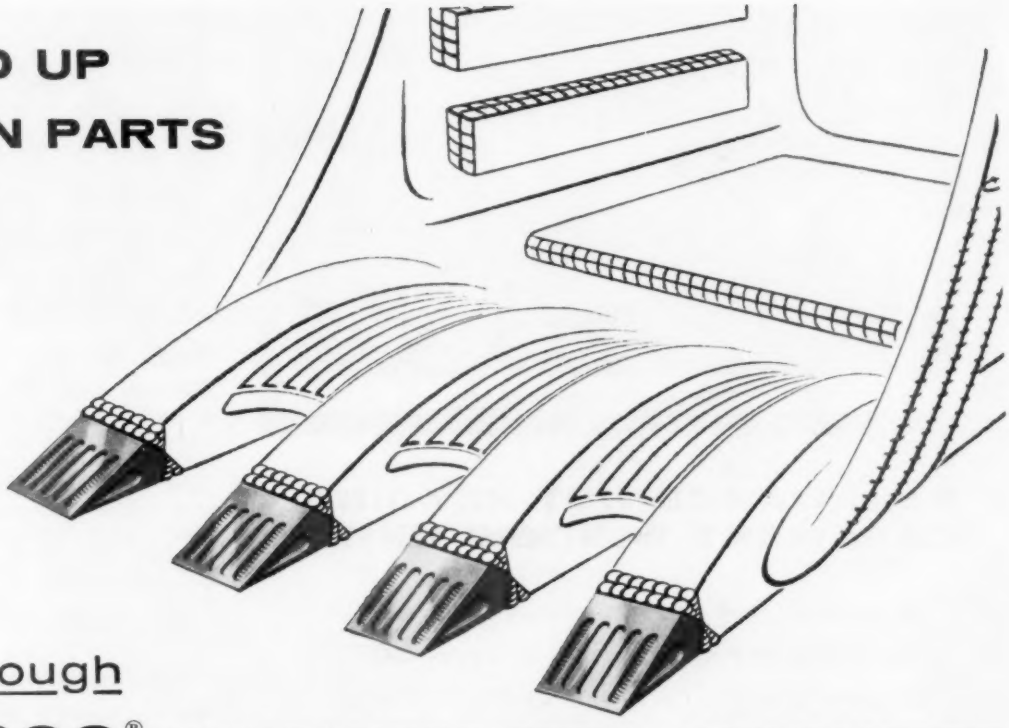
Circle No. 18

Strap clamp

INTERCHANGEABLE pads are featured in a new strap-clamping assembly which holds rough, finished or irregular surfaces. Can be formed to fit any shape of work surface, the manufacturer says. Available from watchmakers' sizes to assemblies large enough to hold big machine tools. *Jergens Tool Specialty Co.*

Circle No. 19

BUILD UP WORN PARTS

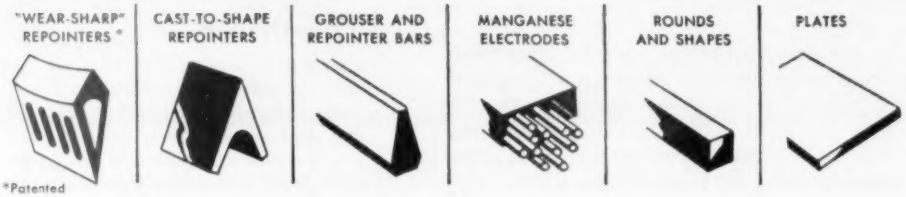


with tough

AMSCO® MANGANESE STEEL WELDMENTS

To replace dipper parts worn away under severe impact and abrasion, Amsco offers Special Shapes, Bars and Repointers for build-up and repair. Often, service life of the rebuilt part is many times that of the original part.

Amsco Manganese Steel is an extra-tough steel that has proved itself in years of use to be especially suited for applications where impact and abrasion are major problems.



*Patented

Amsco Special Shapes, Bars and Repointers can be torch cut, tacked or joined together with Amsco Manganese Electrodes. The worn parts can be restored over and over again in this manner, assuring a longer work-life for service parts. Amsco Hardfacing Electrodes can be used to give additional wear-resistance at severe wear points.

Contact your Amsco Welding Distributor for complete information. Or write for Amsco Bulletin MN-56 to American Manganese Steel Division, Welding Products Department, Chicago Heights, Illinois.

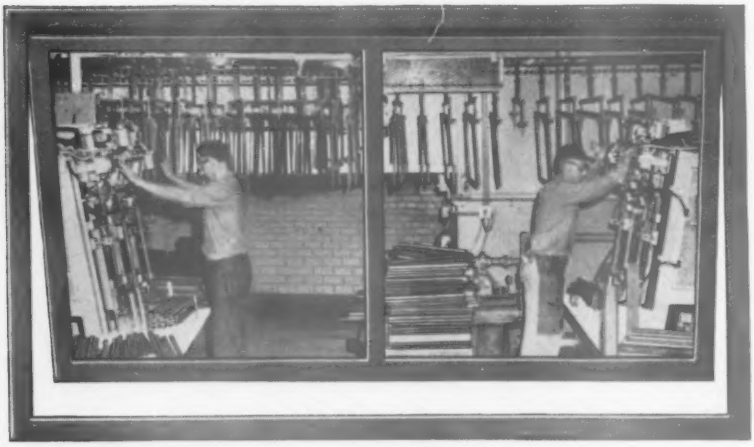
Amsco Welding Products distributed in Canada by Canadian Liquid Air Co., Ltd.

AMERICAN Brake Shoe COMPANY

AMSCO

American Manganese Steel Division • Chicago Heights, Ill.

OTHER PLANTS IN: DENVER, LOS ANGELES, NEW CASTLE, DEL., OAKLAND, CAL., ST. LOUIS, JOLIETTE, QUEBEC



RESISTANCE HOT-HEADING CASEMENT WINDOW UNITS

Production . . . . . Up 40%
Unit Labor Cost . . . . Down 50%
Inspection . . . . . Eliminated
Morale . . . . . Improved

Production of steel window frames and sash was increased by 40% and labor costs cut in half when the U. S. Gypsum Co., Warren, O., installed two Taylor-Winfield resistance welders to join parts of the two assemblies. Because of the consistent quality of the hot upset joints, the firm reassigned an inspector who formerly checked the sash and frame sections. Officials also report improved worker morale and less fatigue due to eliminating noisy air hammers that previously cold-headed the sash and frame joints.

In this streamlined assembly operation, one machine joins frames and the other joins sash. The operators place the frame and sash parts in position, where they are automatically clamped. Pairs of frame and sash go through further processing together. Adjustable tooling permits assembly of all sizes of frame and sash manufactured by U. S. Gypsum.

Finding means of increasing your production and lowering your fabrication costs is Taylor-Winfield's business. Contact the nearest T-W office.

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WARREN, OHIO

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OAKVILLE AND WINDSOR, ONTARIO

Angle holder

MAGNETIC angle holder called "Permatin" is constructed of metal and has a plastic knob for angle selection. Circular magnetic clamps are at either end of the holder and a graduated scale is included for setting the desired angle of clamp. Angles measure from 0 to 180 degrees. *Emanuel S. Klausner, Inc., National Cylinder Gas Co.*

Circle No. 20

Contact protectors

SERIES of selenium contact protectors eliminates arcing and erosion across the contacts of relays or switches in most electrical circuits, manufacturer says. Three basic configurations are available; small encapsulated diode type for application in limited space, fibre tube cartridge types and hermetically sealed cartridge types for application in severe environmental conditions. *International Rectifier Corp.*

Circle No. 21

Co-polymer

COMPOUND with exceptional oil and fuel resistance at extreme temperatures is for difficult bonding and sealing applications. Designated SR 251-70, the new compound is for prototype work and small production orders. May be bonded to aluminum and other metals, making it desirable for poppet applications at temperatures as low as minus 65 deg.

For dynamic sealing, minimum recommended temperatures range from 400 F to 500 F, depending on duration of heating. Suitable for both dynamic and static sealing. *Stillman Rubber Co.*

Circle No. 22

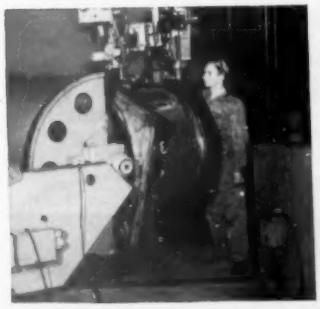
Spot welder

VERTICAL spot welder Model 93-V-1 has new contact adjustment, can be mounted close to another model for two operations with one operator. *Eisler Engineering Co., Inc.*

Circle No. 23

Worthington turning rolls handle a difficult welding job smoothly and easily in Foster Wheeler's Mountain Top, Pa., plant.

Why do 93 out of 100 leading industrial corporations use Worthington positioning equipment?



Worthington welding positioner in Foster Wheeler's Mountain Top, Pa., plant.

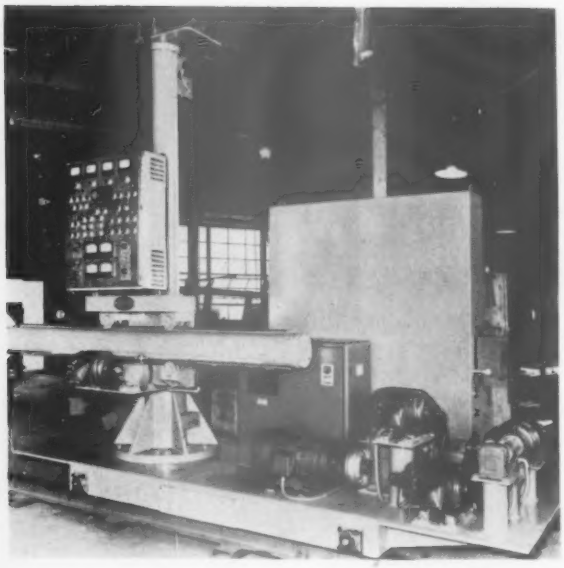
It's a fact. Of the 100 largest industrial corporations listed in the latest Fortune Magazine Directory, 93 are users. Progressive companies such as General Motors, General Electric and General Dynamics are long-time owners of precision positioners and turning rolls built by Worthington.

One reason why leading manufacturers have turned to Worthington is good service. With distributors in all principal cities, a Worthington specialist is always nearby to help solve your positioning problems.

Conservative ratings are another. Refusing to compromise with quality, Worthington engineers positioners to deliver, year after year, the rating stamped on the nameplate.

Pick your next positioner from Worthington's complete line. For helpful information on positioners, automatic welding head manipulators, turning rolls, head and tailstocks, write to Section Y-73, Worthington Corporation, Harrison, N. J. In Canada: Worthington, Ltd., Brantford, Ont.

WORTHINGTON



COMPLETE control of all ram machine movements is possible with this new twin-head ram-type manipulator.

Manipulator

HEAVY-duty twin-head ram-type manipulator offers complete control of all ram machine movements plus independent and simultaneous control of both heads. Controls on the model will start and stop the arc, inch wire up and down, raise and lower current, and start and stop flux feed.

Vertical adjustment of ram and heads features double chain with counterweight inside column. Column and ram rotate 360 deg within the base and may be locked at any point. Welding may be performed with ram or track travel since either motion offers minimum vibration, claims the manufacturer. *C. B. Herrick Mfg. Corp.*

Circle No. 24

Filler rod

LOW-FUMING, manganese-bronze filler rod is intended for brazing and braze welding steel, cast iron, malleable iron, copper and copper-base alloys, in addition to overlaying bearings and other wear-and-corrosion-resistant surfaces. Produces high-strength joints up to 60,000 psi; overlay deposit hardness is 80-110 BHN. *Ampco Metal, Inc.*

Circle No. 25

Tube tungsten

Now marketed is a "Composite Rod" which meets requirements of fishing tool manufacturers and rebuilders. The rod is a nickel-silver tube matrix with sharp particles of virgin, tool-bit-grade, sintered tungsen carbides. *Stoody Co.*

Circle No. 26

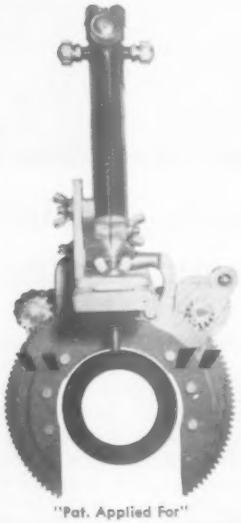
Aluminum alloy

HIGH strength alloy developed for welded aluminum structures should find extensive application in process industries where aluminum vessels, storage tanks and piping are required to handle hot chemicals. Alloy provides maximum strength for aluminum applications exposed to temperatures from 150 to 300 F. *Aluminum Co. of America.*

Circle No. 27

model "O" for small diameter pipe cutting and beveling

model



"Pat. Applied For"

Welding of small diameter pipe (1½" to 4") becomes the easiest, quickest, most accurate — **and most economical** — means of joining such pipe when every cut and bevel is square and accurate.

The never-failing precision-action of H & M's exclusive Model "O" has been field-tested and proved on hundreds of welding jobs — **even** when operated **by apprentice welders!** A perfect cut and bevel can be made on 2" pipe, for instance, in less than 30 seconds actual cutting time — **by an inexperienced operator.**

The H & M Model "O" is built on the same split-gear horseshoe principle as the larger H & M Machines (for 4" to 36" pipe). Weighing only 7½ lbs., it may be placed on continuous pieces of pipe — moved from one pipe to another — changed from one size to another — **all in a matter of seconds!**

If you are manually welding your small-diameter pipe — or if you aren't welding at all — an H & M Model "O" Pipe Cutting and Beveling Machine is your primary step towards greater speed, accuracy, precision and profits in joining small diameter piping.

The Model "O" — like all H & M Machines — can easily and quickly be motorized for automatic operation.

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H&M PIPE BEVELING MACHINE COMPANY

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Automatic Aircomatic® welding of longitudinal seam with CO_2.

CO_2...low cost gas shield for metal arc welding

Carbon dioxide is fast gaining acceptance as a most economical shielding medium among fabricators of arc welded mild steel. It's ideal for single or multi-pass applications . . . *manually* or *automatically*.

Pureco Technical Sales Service can give you all the information you need about CO_2 in welding. Call your Pureco representative today! There are more than 100 locations from coast to coast for your convenience.

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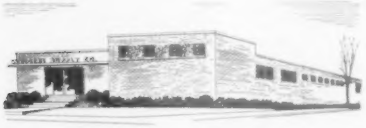
PURE CARBONIC COMPANY is a division of **AIR REDUCTION COMPANY, INCORPORATED** • Principal products of other divisions include: **AIRCO** — industrial gases, welding and cutting equipment and acetylenic chemicals • **OHIO** — medical gases and hospital equipment • **NATIONAL CARBIDE** — pipeline acetylene and calcium carbide • **COLTON** — polyvinyl acetates, alcohols and other synthetic resins.

NEWS . . . . . *from page 6*

conscious ultrasonic producer to accommodate them with this novel form of energy."

Platzman recently resigned as director and vice-president of Acoustica Associates, Inc., a Long Island firm he helped found.

Besides catalog and off-the-shelf equipment to be sold and rented direct and through distributors, the company will supply ultrasonic components to equipment manufacturers. It will also offer research and development services.



Welders Supply Building nears completion

A modernized Welders Supply Co. building should soon be ready for business in Little Rock, Ark. The building includes sales room, display room, loading dock, offices, meeting room, warehouse space and an oxygen and nitrogen plant. The new Independent Engineering Co. 70-meter oxygen plant makes Welsco oxygen and nitrogen and is equipped to produce liquid oxygen and nitrogen.

Manager R. G. Harrison reports that a new, proposed federal expressway will run within one-half block of the new plant.

Italian, Belgian firms get Westinghouse know-how

Fiat, one of Italy's largest manufacturers, has agreed to build and sell full-scale atomic power plants under license from Westinghouse Electric International Co. Westinghouse signed a similar agreement with Belgium's largest electrical manufacturer, Ateliers de Constructions Electriques de Charleroi.

Under the agreement, Fiat will build pressurized-water nuclear reactors and other non-military types developed by Westinghouse. Belgium is the first foreign country to get technical information for production of the atomic power plants.

Aluminum coated for supersonic use

Because of a new process which applies a ceramic coating to the "strong" structural aluminum alloys, the light-weight alloys are now available for supersonic, high temperature uses in the aircraft industry. Before, attempts to porcelain enamel 24-S and 75-S, the most used alloys, have resulted in blistering, bubbling, brittleness and warping.

Dr. Paul A. Huppert, of Gulton Industries' research department, invented the process which allows aluminum alloys to withstand prolonged heat at 1,300 to 1,350 F without collapsing.

"Structural aluminum alloys in sheets, coated on both sides, will still be ⅓ the weight of comparable sheets of steel and retain their strength for use as aircraft skins at the supersonic range of 300 to 700 F," Dr. Huppert said.

Isotopes study tool wear

Radioisotopes are now being used to record continuous changes in tool wear, a General Motors Co. research staff reports.

NCI conference in Chicago

Creative trends in structural design will be examined at the National Construction Industry Conference Dec. 11 and 12 in Chicago. Sponsored by Armour Research Foundation of Illinois Institute of Technology, the two-day meeting on forms, materials, methods and applications will be held in the Congress Hotel.

NEW AIRCO "DUAL RANGE" FLOWMETERS

VERSATILE. Designed to meter an individual gas or proportion any number of gases. Attaches to cylinder regulators, pipeline regulators, pipeline direct or bench or wall mounted.

WIDE OPERATING RANGE. One meter covers flows formerly requiring more than one device. Easy to switch from high to low range reading.

ACCURATE. Accuracy of the dual range flowmeters is not affected by back-pressure, provided air-inlet pressure of 30 psi is maintained. When 30 psi inlet pressure is maintained, accuracy is within 3% of lower range, slightly less in upper range.

EASY READING. All Airco flowmeters are provided with black graduated scales fixed on the tube against an orange background. Accurately read at a glance.

The new Airco Dual Flowmeters are ideal for inert-gas welding, flushing molten metals, laboratory service and many other industrial uses. Simple, solid construction means minimum maintenance and long service life. Ask your Authorized Airco Dealer for complete information or contact Airco direct.

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HI-AMP® PRESENTS AMERICA'S NEWEST, LIGHTWEIGHT, MOST PRACTICAL ALUMINUM* ELECTRODE HOLDER

MODEL LW-3 LIGHTWEIGHT 300 Ampere

*Kaiser Forged Aluminum

AVAILABLE NOW AT WELDING SUPPLY DISTRIBUTORS THROUGHOUT THE U.S. & CANADA.

OTHER HI-AMP QUALITY PRODUCTS include cable connectors, ground clamps and special ground attachments for positive current transfer to rotating work—EZE feed marking pencils and the Universal circle burner. These well-built, sturdy, dependable products will help increase the efficiency of all your welding operations.

LENCO, INC.

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ONLY HI-AMP ELECTRODE HOLDERS HAVE ALL OF THESE IMPORTANT FEATURES:

1. HIGH IMPACT TIP INSULATORS TO REDUCE MAINTENANCE COSTS.
2. INTERCHANGEABLE TIP INSULATORS TO REDUCE MAINTENANCE STOCK REQUIREMENTS.
3. HIGH HEAT RESISTANT PLASTIC TIP INSULATORS TO WITHSTAND HIGHER TEMPERATURES NEAR WELDING ARC ASSURING LONGER LIFE.
4. PLASTIC HANDLES TO PREVENT MOISTURE ABSORPTION AND WARPAGE AS WELL AS INSULATE GLOVE FROM HOLDER HEAT.
5. HIGH CONDUCTIVITY COPPER FOR LOWER TONG TO CARRY AWAY INDUCTED HEAT FROM ROD, AS WELL AS HIGH ELECTRICAL CONDUCTIVITY.
6. WRAP AROUND PLASTIC TIP INSULATION FOR MAXIMUM ELECTRICAL INSULATION AND HEAT RESISTANCE—30% MORE THAN ANY OTHER MAKE.
7. BRILLIANT RED AND YELLOW PLASTIC COLORS INSURES IDENTIFICATION OF HOLDER ANYWHERE IN PLANT — VALUABLE SAFETY FEATURE.

AND NOW,

8. LIGHT WEIGHT

When You Weld Cast Iron
Select the Correct

Fuse-Well

CAST IRON WELDING RODS
OR ELECTRODES

FUSE-WELL NO. 11

FUSE-WELL No. 11, *Square*—Gray Cast Iron Welding Rod for Acetylene use in filling or building up new or worn castings producing machineable welds.

FUSE-WELL NO. 12

FUSE-WELL No. 12, *Round*—Has the same uses and analytical ingredients as Fuse-Well No. 11.

FUSE-WELL NO. 14 MOLY

FUSE-WELL No. 14, *Moly*—An Iron Base Rod with alloys added for finer grain structure and greater strength.

FUSE-WELL NO. 22

FUSE-WELL No. 22, *Electrode* — Light coated Rod to be used for AC or DC welding in the fabricating and repairing of cast iron castings.

Sold through Leading Distributors

THE CHICAGO HARDWARE FOUNDRY CO.
Weld Rod Division
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Troiano to direct carbon steel meeting

Dr. Alexander R. Troiano, professor and head of the metallurgical department at Case Insitute of Technology, will direct a two-day symposium on annealing low-carbon steel to be held at Case Oct. 29 and 30.

The meeting is sponsored by Lee Wilson Engineering Co., Inc., and Case. During five general sessions, experts from six nations will deliver a dozen papers on annealing processes.

Butt-welded joints in nuclear reactor

Because of temperature and corrosion conditions, butt-welded joints and type 347 stainless steel were used for the sodium coolant piping in the world's first sodium-cooled, graphite-moderated thermal nuclear power reactor system for generating electricity. The unit is now undergoing tests at the Santa Susana, Calif., field laboratory of Atomics International. This experiment may have a great impact on future power developments, the firm says, since engineering of the unique sodium-to-sodium heat exchanger system may lead to production of steam temperatures limited only by turbine performance.

Tube-Turn stainless steel welding elbows, tees, reducers and flanges are employed in the system. These welded fittings were supplied through Allied Supply Co. of Los Angeles.

Nuclear physicist to address ANS

Dr. Henry D. Smyth will speak at the American Nuclear Society's second winter meeting at the Henry Hudson Hotel, New York City, on Oct. 29. He is administrator of research programs for useful power from the harnessing of atomic and hydrogen reactions. The Society is meeting concurrently with the annual Atomic Industrial Forum and the 1957 Trade Fair of the atomic industry.

IAA releases two booklets

Revised editions of "Safe Practices for Installation and Operation of Oxy-Acetylene Welding and Cutting Equipment" and "Braze Welding of Iron and Steel by the Oxy-Acetylene Process" will soon be available. The books, priced at 35 cents each, are published by the International Acetylene Association, 205 E. 42 St., New York 17, N. Y.

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looks like a crayon... marks like a crayon... tells temperatures like a precision instrument!

Available in these Temperatures (F.)

113	375	1000
125	388	1050
138	400	1100
150	413	1150
163	425	1200
175	438	1250
188	450	1300
200	463	1350
213	475	1400
225	488	1450
238	500	1500
250	550	1550
263	600	1600
275	650	1650
288	700	1700
300	750	1750
313	800	1800
325	850	1850
338	900	1900
350	950	1950
363		2000

Sixty-three different compositions enable you to determine and control working temperatures from 113° to 2000° F.

TEMPILSTIK° marks on workpiece "say when" by melting at stated temperatures — plus or minus 1%.

ALSO AVAILABLE IN LIQUID AND PELLET FORM . . . WRITE "WELDING SALES" DEPT. FOR SAMPLE TEMPIL° PELLETS . . . STATE TEMPERATURES OF INTEREST—PLEASE!

Tempil° CORPORATION 132 WEST 22ND STREET, NEW YORK 11, N. Y.

VISIT OUR BOOTH—No. 1041 at the CHICAGO METAL SHOW, November 4-8, 1957

Booklet teaches safety in acetylene

A revised safety data sheet on acetylene gives sections on properties, hazards, engineering control, employee safety, fire fighting, handling and storage, tank equipment, cleaning and repairs, medical management and first aid.

The 11-page booklet is part of a continuing Manufacturing Chemists' Association series of safety data sheets. It has been updated from the 1947 issue and includes a recommended label for cylinders containing acetylene. Copies of Chemical Safety Data Sheet SD-7 are 30 cents each from the Manufacturing Chemists' Association, Inc., 1625 Eye St., Northwest, Washington 6, D. C.

Oxygen plant for Southeast

Georgia's first liquid oxygen plant —a 25-ton unit—will be built on a six-acre site on New Savannah Road in Augusta by Marks Oxygen Co., Inc., Augusta. Several months ago the firm built an acetylene plant on the site.

The liquid oxygen plant will produce 18,000,000 cu ft of liquid oxygen and nitrogen and 425,000 cu ft of argon gas monthly. According to Pierce E. Marks, Sr., president of the firm, the plant will be the largest in the Southeast.

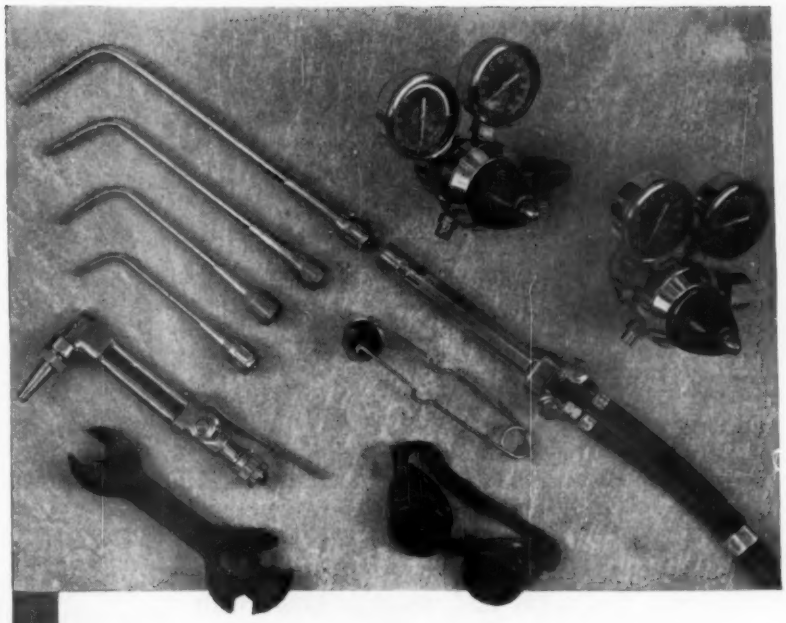
Ultrapure silicon now on market

Impurities are less than one part in six billion in an ultra-pure silicon turned out by Westinghouse. Silicon is a key material in "solid state" electronic devices. Almost all of U. S. silicon production has gone into rectifiers, the firm reports.

New pure silicon permits large volume production of solid state devices with two-to-four times the voltage and power handling capacities of those now in use. L. R. Hill, manager of Westinghouse's semiconductor plant in Youngwood, Pa., said the firm will license other companies in this country to manufacture the new pure silicon.

July high for RWMA shipments

July shipments of resistance welding equipment by members of the Resistance Welder Manufacturing Association surpassed June shipments by nearly 17%, according to Association statistics. July shipments were more than $3 million.



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Now, Liquid Presents A Full, Dynamic Line of *Liquidweld* Gas Welding and Cutting Equipment!

You've seen and heard about the new, functional Liquidweld Regulators . . . Now see the rest of the family . . . torches, cutting tips, nozzles, etc. Here's everything to make good welders even better . . . with the highest quality equipment available to the industry.

Liquidweld . . . precision-machined from bar stock . . . designed to make your welding and cutting safer, with superior results, and a minimum of operator fatigue.

The new Liquidweld line is available in single units, or for greatest efficiency, in complete outfits.

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SAVE COSTLY REPLACEMENTS

...get fast, strong repairs with Bridgeport No. 192 Low-Fuming Bronze Rod

This scale was a vital link in a plant's materials weighing section. Operations slowed down when its cast iron frame was smashed. Braze welding with Bridgeport No.192 Low-Fuming Bronze Rod had it back on the job good as new in a matter of hours... another example of time and money saved through repair with braze welding.

Bridgeport No. 192 is a low-fuming manganese-type, all-purpose rod recommended for both repair and production welding. It tins readily and the base metal needs relatively little local preheating, thus avoiding brittleness. Many repairs are possible without disassembling or moving heavy equipment. And welds are frequently stronger than the base metal.

Write today for your free copy of Bridgeport's new booklet, "Bronze Welding Alloys."

HANDY GUIDE TO BRIDGEPORT WELDING ALLOYS

ALLOY	Welding Method	Approx. Melting Point °F
192 Low Fuming Manganese	GAS	1600
191 Manganese Bronze (Navy)	GAS	1600
196 Bridgeport Bronze	GAS	1600
606 Silicon Bronze (3% Si)	GAS or ARC	1865
548 Nickel Silver	GAS	1675

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Offices in Principal Cities • Conveniently Located Warehouses

Bridgeport Brass Company, Bridgeport 2, Conn. • In Canada: Noranda Copper and Brass Ltd., Montreal

BRASS • BRONZE • COPPER • SHEET • ROD • WIRE • TUBE • ALUMINUM EXTRUSIONS AND FORGINGS

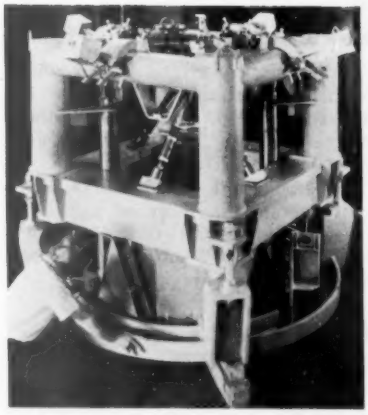
Scaffold, lift truck save time, money

One-month's time and $2,500 were saved on a welding job in an airplane hangar in Minneapolis by installing a simple scaffold on the forks of a heavy-duty lift truck and using the combination as a portable work platform. The scaffold replaced ladders and elaborate rigging.

The job called for rewelding steel girders which support the 45-ft ceiling. The 29-ft scaffold, a simple two-sided affair securely cross-braced, was mounted on a Clark Equipment Co. fork truck with a 16 ft lifting height.

GM awards Gulton Laminagage license

A license for the production of Laminagage has been given Gulton Industries, Inc., by General Motors Corp. Laminagage is a production tool used to check platings and coatings on metals and other electrically conductive materials. The licensing agreement between the two companies is non-exclusive.



FIRING stand to test and launch the Vanguard rocket is roughly a cubical steel framework that measures 6½ ft on a side. The stand can support and hold the rocket in a vertical position, weigh it and disconnect more than 20 fuel and instrument lines at the instant of firing. Built by Loewy-Hydropress Div. of Baldwin-Lima Hamilton.

Atom chiefs give viewpoints

At joint conferences of the Atomic Industrial Forum and the American Nuclear Society, top British and American officials will give their programs for developing atomic energy for constructive purposes. Sir Edwin Plowden, chairman of the United Kingdom Atomic Energy Authority, and Lewis L. Strauss, chairman of the U. S. Atomic Energy commission, will speak Oct. 29 at a banquet in New York City.

Caterpillar builds engine plant

Twelve miles north of Peoria, Ill., Caterpillar Tractor Co. is breaking ground for the first of three facilities to be built on a 1,100-acre area. The new industrial engine plant will be finished by early 1959, the firm reports. It will manufacture the company's two largest engine models.

Stulz-Sickles holds annual sales meet

Eleven district sales managers and three executives of the Stulz-Sickles Co., Elizabeth, N. J., met Sept. 17-19 for their annual sales meeting. District sales managers inspected the new Stulz-Sickles plant in Elizabeth and proceeded to Asbury Park where they spent two days in sales meetings and discussions.

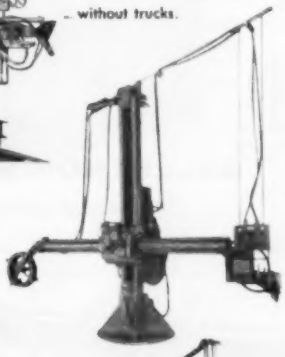
A *Cayuga* WELDING HEAD MANIPULATOR

For Every Job — Large or Small

Cayuga Weldomatic Manipulators are built in a wide range of sizes and variety of models. Designed for automatic longitudinal welding and for use with turn tables, turning rolls and positioners. Available with or without trucks.

CAYUGA SUPER CHIEF

CAYUGA BIG CHIEF



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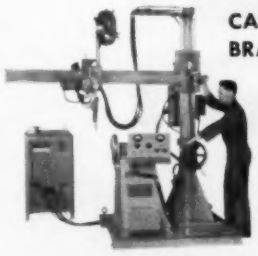

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Write for complete information – send job specifications for recommendations.

More Comfort-Greater Safety

RIGID BAR No. 621

NEW

SELLSTROM

619 AND 621

JUMBO CHIPPING GOGGLES

EXCLUSIVE DOUBLE-FILTER VENTILATION MEETS ALL FEDERAL SPECIFICATIONS. Diagram (left) shows how air is double-filtered through fine brass screen for greater eye comfort and protection.

FLEXIBLE BRIDGE No. 619

These new lightweight SELLSTROM Jumbo Chipping Goggles increase eye comfort and safety in chipping and grinding work. Both styles fit easily over personal glasses. Complete with clear hardened safety lenses.

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BECKER

CARBON WELDER BRUSHES

for all types and makes of welding equipment

Everything you need from *one* source, with *one* responsibility. The fast, economical way to order. Catalog gives complete specifications, factory numbers, scaled drawings, etc. Write for your free copy today.

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Wyatt wanders down Mexico way

A Texas firm moved farther south with the acquisition of Productos de Hierro y Acero, SA, a metal fabricating concern with headquarters near Mexico City.

Wyatt Metal & Boiler Works, Inc., will operate the plant as a wholly owned subsidiary. T. J. Uhl, production manager of Wyatt's Dallas plant, will manage the Mexican firm.

Free Tickets to AtomFair

Complimentary tickets to the 1957 Trade Fair of the Atomic Industry Oct. 28 to 31 are available by writing, on business letterhead, to AtomFair, 3 East 54th St., New York 22. More than 120 organizations will offer displays on constructive uses of the atom. The fair is designed to give business and technical management a chance to see the latest developments in atomic energy research and application.

Wisconsin blacksmiths, weldors gather

Appleton, Wis., was the scene of the 55th convention of Wisconsin blacksmiths and weldors. The annual affair was held Sept. 20 through 22.

World movement for "cold weld"

The first step in the formation of a Unilock International Association of North America is the formation of a three-man interim council of management.

Unilock is a process used to repair industrial equipment and machinery. It is sometimes called metal surgery or cold welding. However, it is "in no sense a substitute for welding, but a method of repair based on entirely different principles," says E. C. Peckham, controller of Metalock International Association.

Council members are R. Rectenwold, president of Maintenance Engineering Corp., Pittsburgh; George Jackman, president of Metal Locking Services, Inc., Buffalo; and William Scott, president, Herculock Ltd., Niagara Falls, Ont.

Gregory builds engineering staff

With expansion in highway construction and in other major markets for its Nelson stud welding products, Gregory Industries, Inc., Toledo, Ohio, is in the process of increasing its field engineering staff by 40%.

COMING EVENTS

OCT. 7-9: National Electronics Conference, co-sponsor Illinois Institute of Technology, Hotel Sherman, Chicago.

OCT. 21-25: National Safety Congress, Chicago.

OCT. 27-NOV. 1: Fourth Annual conference, Atomic Industrial Forum, Second Fall meeting America Nuclear Society, and Trade Fair of Atomic Industry, Coliseum, New York City.

NOV. 4-8: Thirty-Ninth National Metal Exposition & Congress, concurrently with Second World Metallurgical Congress, American Society for Metals, International Amphitheatre, Chicago.

NOV. 11-12: NWSA West Central Zone Meeting, The Cosmopolitan, Denver.

NOV. 14-15: NWSA Western Zone Meeting, Riviera Hotel, Las Vegas.

DEC. 2-3: NWSA Southeastern Zone Meeting, Atlanta Biltmore, Atlanta.

DEC. 5-6: NWSA Southwestern Zone Meeting, The St. Anthony, San Antonio.

JAN. 27-30: Ninth National Plant Maintenance & Engineering Show, International Amphitheatre, Chicago.

MARCH 19-21: Fifty-eighth Annual Convention, International Acetylene Association, Bellevue Stratford Hotel, Philadelphia.

APRIL 14-17: Sixth Annual Welding Show, American Welding Society, Statler and other hotels, St. Louis.

APRIL 14-18: Sixth Spring and Thirty-ninth Annual Meeting, American Welding Society with American Society of Mechanical Engineers Conference, St. Louis.

MAY 5-8: Fourteenth Annual Convention, National Welding Supply Association, Americana Hotel, Miami Beach, Fla.

National Carbon winds up 7-year expansion program

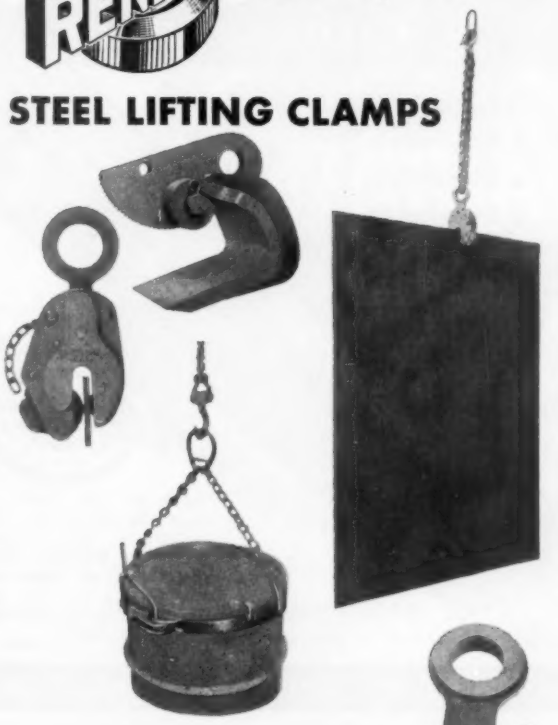
A $50 million, 7-year industrial expansion program adding nearly 100,000 tons of annual productive capacity at plants across the country has been completed by National Carbon Co., a division of Union Carbide Corp. This second major expansion since World War II has made it possible to meet demands for carbon and graphite, National Carbon President Adger S. Johnson declared.

Tracerlab opens St. Louis office

A new sales office will be opened in St. Louis, Mo. by Tracerlab, Inc., Waltham, Mass. John Eills, formerly of Boston, will be in charge of the office.

RENFROE Safety Snap Lock

STEEL LIFTING CLAMPS



HANDLE STEEL WITH SAFETY

√ Maximum Speed and Safety
√ From ½ ton to 20 ton sizes
√ Lock on in any position
√ Lock off in any position
√ Exceptionally light in weight
√ The toughest clamp ever built
√ Takes the place of welded pad eyes and screw clamps
√ Cannot be accidentally knocked off
√ Safety Factor 5 to 1

A Superior Line of Steel Lifting Clamps designed to meet today's demand for handling steel with maximum SAFETY and EFFICIENCY.

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ALL-STATE
ALLOYS AND FLUXES

Alloys and Fluxes for joining ALL METALS ALL METHODS

TORCH WELDING

SOLDERING - FILLING - SEALING

TORCH BRAZING

FURNACE BRAZING

ARC WELDING

They Save On:
- Preparation
- Dismantling
- Reassembly
- Cleanup
- Heat
- Time

Seldom cost as much as 1% of savings made!

ALLOYS and FLUXES All-State

Look for this trade-mark at your Welding Supply Distributor's. All metals. All methods. All-State is your assurance of these advantages when you buy. Ask for new Instruction Book on 62 alloys and fluxes.

ALL-STATE WELDING ALLOYS CO., INC., WHITE PLAINS, N. Y.

DIAL SET LEVEL _____

MARK A CENTER LINE
at any angle

DIAL SET 45°

TO ESTABLISH AND MARK a point at any degree of angle on shaft, pipe or tube without numerous calculations or "cut and try" methods use the Boyce Centering Head. It's a must for welders, machinists, pipe fitters and boilermakers because it is *absolutely accurate* and saves time. Small enough to fit in your pocket, it weighs only 9 ounces. Order yours today or write for information.

CONTOUR MARKER CORP.
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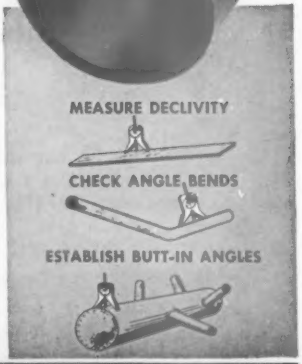

Boyce CENTERING HEAD

Ryerson opens Indianapolis plant

Newly opened for business is the steel service plant of Joseph T. Ryerson & Son., Inc., at 6701 E. English Ave., Indianapolis, Ind. A two-span warehouse, sheathed in aluminum, will be fully heated in winter while offices are air-conditioned in summer.

Equipment in the plant includes two bridge cranes of 15 and 10 ton capacity, a high speed friction saw for cutting structural steel shapes, shears for cutting sheet and plate steel, hack saws for cutting bars and tubing, and a mechanized flame cutting machine.

Situated on a 14-acre site, the plant has sandwich-type insulated walls with outer surface of aluminum. Robert L. Larson is general manager of the plant.

Tracerlab ships radiation protectors

The French Atomic Energy Commission recently received a large order of radiation protection devices, to be used by its personnel, from Tracerlab, Inc., Waltham, Mass.

Iowa smithies, weldors mark 49th convention

Iowa blacksmiths and weldors recently wound up their 49th annual convention with a banquet held at Red Oak, Iowa. The group elected Ralph Keller its president, Floyd Whitten, vice-president and Vern Smith, treasurer. W. F. Albee was re-elected secretary.

Harold Fiebelkorn copped the "Iowa blacksmith of the year" title.

CGA sets standard for hydrogen storage

The Compressed Gas Association, Inc., is attempting to develop a standard for installing hydrogen storage systems. The need for such a standard came about because of recent inquiries by such authorities as the National Fire Protection Association.

Distributor appointments

Harnischfeger Corp., Milwaukee: Florida Gas & Chemical Corp., Hollywood, Fla.

Ampco Metal, Inc., Milwaukee: Columbus Welding Supply Co., Columbus, Ga.

Shieldalloy Corp., Newfield, N. J.: Whitehead Metal Products Co., New York City.

Metal & Thermit Corp., Rahway, N.J.: Odland Iron Works, Toledo, Ohio.

Hobart Bros. Co., Troy, Ohio; Industrial Air Products Co., Portland, Ore.

Richard C. Lipps takes over as manager of the Welding Dept. of Westinghouse Electric Corp. *Harry J. Bichsel* is engineering manager of the department. Lipps is responsible for the company's arc welding activities. He succeeds *W. J. Delaney, Jr.*, now manager of the firm's X-ray and Industrial Electronics Div. At plants in Buffalo, N.Y., and Montevallo, Ala., the Welding Dept. manufactures welding products including a-c and d-c welders.

Fred J. Joyce and *John P. Thomas* are new sales representatives for A. O. Smith Corp.'s Welding Products Div. Joyce will operate in Oakland, Calif. He was with Metal & Thermit. Thomas, previously with Eutectic Welding Alloys, Inc., will headquarter in Atlanta.

John J. Wagner, Indianapolis, has been chosen sales representative for the grinding wheel division of Electro Refractories & Abrasives Corp., Buffalo. He will be responsible for sales in Indiana.

Carl Ludwig has been named chief engineer of the Engineered Products Div., Wellman Engineering Co., a manufacturing affiliate of McDowell Co., Inc., Cleveland.

John F. Callahan, assistant advertising manager of Air Reduction Sales Co., celebrated 40 years with the firm on August 11. He started with Airco in 1917 as a mail room messenger. In 1921 he went into the firm's advertising department, and has been assistant advertising manager since 1938.

AT THE FRONTIERS OF PROGRESS YOU'LL FIND

AN AIR REDUCTION PRODUCT

FOR WELDING AND CUTTING...

IN THE RED DRUM

HIGHEST QUALITY

DUST-FREE

NATIONAL CARBIDE

Write for the name and address of the NATIONAL CARBIDE supplier nearest you.

National Carbide Company

GENERAL OFFICES: 150 East 42ND STREET, NEW YORK 17, N. Y.

A DIVISION OF AIR REDUCTION COMPANY, INCORPORATED

THIS IS LOW COST WELDING!

When a touch on a button moves weldments like these into the correct, most convenient position for a downhand pass, you get more arc time, more welding at lower cost. C-F power operated Positioners rotate the work in a full circle at any point in a range of 135° from the horizontal—giving welders a choice of an infinite number of downhand welding positions instantly.

Every requirement for faster, better positioned welding—constant or variable speed table rotation, full 135° tilt, self-locking gearing which holds the table in any position, oversize built-in main tilt, and rotating bearings, choice of two base styles, and many other features—are built into C-F Positioners.

C-F Positioners are available in Hand or Power operated models, and are made in capacities up to 30,000 lbs. and larger.

Write for the new C-F Positioner Catalog

CULLEN-FRIESTEDT CO.

1302 S. Kilbourn Avenue Chicago 23, Illinois

C-F positioned welds mean better, more economical welds

CULLEN-FRIESTEDT CO., CHICAGO 23, ILL.

3 answers . . . TO MAINTENANCE WELDING PROBLEMS

MANGANAL FLO-KOTE (HEAVY COATED, AC-DC)

MANGANAL SPECIAL TITE-KOTE (LIGHT COATED, AC-DC)

MANGANAL BARE (UNCOATED, DC ONLY)

11% — 13½% MANGANESE - NICKEL STEEL WELDING ELECTRODES

for

- REBUILDING WORN SURFACES
- ATTACHING MANGANAL APPLICATOR BARS AND PLATES
- WELDING MANGANESE STEEL TO ITSELF OR OTHER STEELS

NATIONAL WELDING EQUIPMENT ASSOCIATION MEMBER SOLE PRODUCERS

Write for ELECTRODE BULLETIN and name of NEAREST DISTRIBUTOR

STULZ-SICKLES CO.

PORT AVENUE at JULIA ST. ELIZABETH, NEW JERSEY

TIG WELDING
Made Easy With
"Visuweld" Torches

VISUWELD torches improve and simplify tig welding by giving faster and better welds with less effort and minimum torch maintenance.

- The lightest and smallest 350 amp TIG welding torch with super maneuverability.
- Only TIG torch made with standard size transparent cup that guarantees absolute welding visibility.
- NO SPARE PARTS NECESSARY. No gaskets or parts to 'screw together'.
- VISUWELD contained unit torch head guarantees no water or gas leakage, and the coolest TIG welding torch ever designed.

Perfect welds at welding ranges from 3 to 350 Amps eliminates the need for 'standby' torches. VISUWELD torches are 3 torches in 1.

TEC TORCH CO., Inc.
300 Paterson Ave. Carlstadt, N. J.

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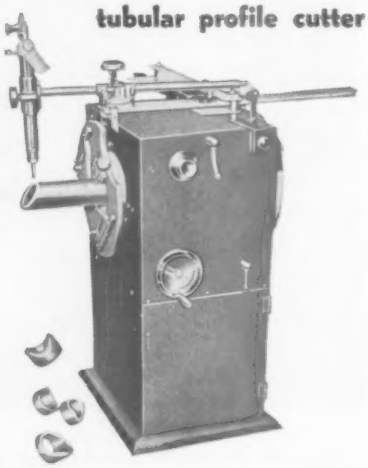
tubular profile cutter



It's versatile! You can make all types of precision flame cuts on pipe or tubing with this machine; angles, miters, saddles, bevels, spiral slots, notches, cams, serrations, and many different shapes or profiles.

See your welding supply dealer, or write direct for descriptive folder.

NICKELSON
Tool & Die Company, Inc.
1107 South West Street
WICHITA KANSAS

In 1907 *H. B. Horton* came to work for the firm his father founded, Chicago Bridge & Iron Co., Chicago. Fifty years later — August, 1957 — 200 friends helped Horton celebrate his 50th anniversary with the company at a reception at the Conrad Hilton Hotel.

He has been a director since 1913; from 1913 to 1947 he served as treasurer and was president from 1945 until his election as chairman of the board in 1956. Horton retired from some of his executive duties, but remains a director of CB&I Co., Ltd., Venezuela, and a director of the John I. Hay Co.

Edward L. Carlson has been put in charge of information services for Oakite Products, Inc., New York. He has been advertising manager since 1947.

Appointed general manager of Lindberg Engineering Co.'s manufacturing plant in Downey, Calif., is *K. A. Lang*. He is also responsible for sales in the 11 western states. Lang has been with Lindberg for 20 years.

Bent Laune, a former president of All State Welding Alloys, has become sales manager of Alloy Specialties Co., Swissvale, Pa.

George E. Drake has been chosen vice-president in charge of sales of Electro Metallurgical Co., a division of Union Carbide Corp. He was assistant general manager of the silicones division. *Stanley M. Norwood* has been appointed assistant to the president.

The Aluminum Div. of Olin Mathieson Chemical Corp. will open seven new sales offices, installing seven new regional sales managers: Chicago, *John M. Welch;* Detroit, *Fred H. Edgar;* Cincinnati, *Forrest F. Tiffany;* Philadelphia, *A. F. Meyers;* Dallas, *W. P. Liljestrom;* Houston, *James H. Wright;* Memphis, *R. B. Polonus.*

R. E. Esch, general manager of Vicker's International Div., has been elected a vice president of the parent company in Detroit. He will be responsible for all operations outside of the U. S., including plants in Australia, Canada, England, Germany as well as licensees and distributors in 16 foreign countries.

Chicago's Van Straaten Chemical Co. has a new general sales manager—*John J. Egan, Jr.*

New field representative in the Houston area for Alloy Rods Co., York, Pa., is *William C. Rash.* His welding experience dates back to 1926, when he enrolled in General Electric's welding school. Since then he has been with G-E and Baldwin-Lima-Hamilton.

J. K. Parks is Metal & Thermit Corp.'s new director of purchases and traffic, while *G. B. Lederer* is general purchasing agent of the New York firm. Parks, formerly with Burns & Roe, Inc., joined Metal & Thermit in 1954. Lederer has been with the firm since 1941.

The American Association of Cost Engineers has selected *E. F. O'Connell* as chairman of the cost records subcommittee on standardization. The group made the appointment at its first annual convention held recently at the University of New Hampshire in Durham. O'Connell is Air Reduction Co.'s chief estimator.

Dr. John H. Hoke has been appointed supervisor of Crucible Steel Co.'s stainless steels section of the central research laboratory in Pittsburgh. He will direct the lab's stainless steels program.

Technical editor in Carborundum Co.'s public relations branch is *Richard L. McKee.* He will direct the Niagara Falls, N.Y., firm's publicity program in trade journals. McKee was staff assistant in the industrial relations division.

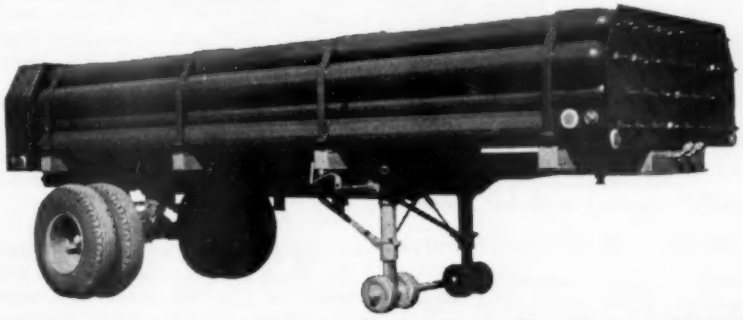
W. P. Metcalf has been appointed assistant purchasing agent of Air Reduction Co., Inc., New York. He has been purchasing agent for National Carbide Co., a division of the firm. Metcalf started with Airco in 1942, handling purchasing for National Carbide since 1944.

Air Products, Inc., Allentown, Pa., recently added three chemical engineers to their research staff: *Dr. Leo DiRicco, Willard L. Ent* and *Albert M. Momenthy.*

REDUCE CYLINDER HANDLING up to 50%

with INDEPENDENT *Gas Supply TRAILERS*

TRANSPORTING — Argon — Carbon Dioxide — Helium — Nitrogen — Oxygen — Boron Trifluroide — Hydrogen — Ethylene. Trailer capacities from 187,000 cu. in. to 750,000 cu. in. water capacity. Trailer tubes ICC3A-2400 Specifications with 2400 PSIG Working Pressure.



Sizes and weights to meet all State requirements.

Can be mounted on bases for permanent storage.

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District manager in Philadelphia for Tube Turns is *S. Merle Hardison.* He has been with the firm since 1941. He succeeds *W. E. Geiser,* who has returned to headquarters staff in Louisville, Ky., to take part in a phase of the firm's expansion program.

Hardison

In top-level changes at Wheelabrator Corp., *James F. Connaughton* was elected executive vice-president; *Harold M. Miller* was advanced to senior vice-president; *Jacob A. Schmidt, Jr.,* became secretary-treasurer; *John M. Wolf* was chosen controller, and *Edward T. Sullivan* was appointed assistant secretary and assistant treasurer.

Arthur L. Phillips, editor of the *Welding Handbook,* has been named secretary to the Educational Activities Committee of the American Welding Society. Educated in England, he has American, Canadian and British industrial and editorial experience.

New general manager of General Electric's X-ray department is *Dr. Lyman R. Fink.* He will be responsible for functioning of the branch which manufactures medical and industrial X-ray and other electronic equipment. The department operates plants in Milwaukee and St. Petersburg, Fla.

W. Lee Williams has been appointed superintendent, Metals Div. of the U. S. Naval Engineering Experiment Station's Metallurgy department which unites the work of the former welding and metallurgical laboratories at the Annapolis, Md. station.

A. Lincoln Clifford, John R. Deobald and *Daniel E. Doudna* have joined Lincoln Electric Co.'s district offices at Columbus, Ohio, Cleveland and Chicago, respectively. All three were in the firm's training program in Cleveland.

Morton M. Jenkins joins the Byers Co., Pittsburgh, as steel sales metallurgist.

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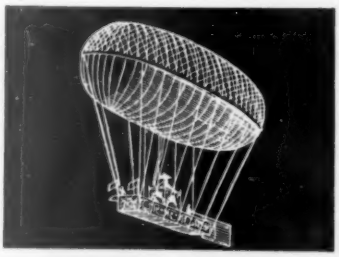

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General manager, engineering and development of Tracerlab, Inc., Waltham, Mass., is *W. Harrison Faulkner, Jr.* He was formerly chief engineer of the industrial division, and has been with the firm since 1948.

National Welding Equipment Co., San Francisco, recently promoted *Henry L. Pohndorf* to vice president and works manager; *Bart Peacock* to sales coordinator; *John H. Calderoni* to development engineer; *Paul Yeoman* to general plant superintendent.

Michael P. Heneghan has been chosen assistant manager of the Boston district of U. S. Steel Corp.'s Supply Division.

A. B "Cap" Steele has been appointed sales personnel manager for Olin Aluminum. He will be responsible for selection and placement of sales department personnel and for the development, administration and coordination of sales compensation and training programs. *John M. Welch* takes over as Chicago sales manager for the company. He will headquarter at the Chicago district offices in Lincolnwood, Ill. Welch had been with Kaiser Aluminum & Chemical Corp.

John W. Slattery is general supervisor-Stainless Steel Field Sales for Crucible Steel Co. He will headquarter in Pittsburgh at the firm's main offices. Slattery has been Midwest supervisor of Stainless Steel Sales.

Died . . .

Dr. Claude Cornelius Van Nuys, 79, died August 20 at Brea, Calif., following a brain operation. He was chief physicist for Air Reduction Co., Inc., until retiring in 1949. Dr. Van Nuys joined Airco in 1918, and was in charge of the physics section in the firm's research and engineering department when he retired. He obtained patents for liquefaction and separation of air and other gas mixtures for Airco.

William J. Magee, 68, retired treasurer and director of Norton Co., died August 26. He had been with the firm for 25 years, serving as controller from 1934 to 1941, and as assistant treasurer until 1946, when he became treasurer and director. He also served as treasurer of Norton Behr-Manning Overseas, Inc., the firm's overseas sales and manufacturing division, and of Norton Co. of Canada, Ltd., Hamilton, Ont.

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Cold bending

COLD BENDING OF METALS. Published by Wallace Supply Mfg. Co., Chicago, 1956. Simulated leather, spiral bound, 9½ by 6 in., 100 pages. Price $2.

This is a revision of the cold bending manual published some ten years ago by the same organization. It is actually two books in one. The first is devoted to general bending information—how to make a bend; machines and tools required for automatic and manual bending; how these machines may be maintained, and an extensive section dealing with design and theory of cold bending.

The second part is a reprint of an article prepared by E. J. DeWitt and F. D. Alexander, entitled "Some Considerations of Cold Bending of Tubular and Structural Shapes." Many useful tables and other helpful data pertaining to bending are a feature of this book.

Structural design

STRUCTURAL DESIGN IN METALS (Second Edition). By Clifford D. Williams and Ernest C. Harris. Published by Ronald Press Co., New York, 1957. Cloth, 6 in. x 9 in., 627 pages. Price $8.00.

This is a valuable textbook for students interested in structural design as well as an excellent reference for practicing engineers. The new edition, some 60 pages larger than the original volume, has been revised extensively to incorporate new material and illustrative examples that reflect the latest specifications in design methods. Many of these added pages have been in the appendix, which contains the latest current specifications on various phases of structural design as touched upon by the American Association of State Highway officials, American Railway Engineering Association, American Welding Society, American Society of Civil Engineers and the American Iron and Steel Institute.

The greatest addition to the text itself is in the chapter on rigid frames which, unfortunately, devotes more space to other joining methods than it does to welding—the method ideally suited for a rigid frame structure. The discussion on plate girders also leaves something to be desired when the authors devote 40 pages to riveted plate girders and only 11 to welded plate girders!

One paragraph in the chapter on plate girders does throw a challenge to the welding industry that should be answered. This paragraph says, in part, "Considerable uncertainty about fatigue properties of welded members has delayed the use of welded girders for railroad bridges, but many such girders are used in industrial plants and highway bridges." The book, which goes into the *why* of structural engineering in the introductory chapter, contains other chapters on rivets, bolts and pins; welding; selection of sections; connections; plate girders; trusses; bearings; light-gage structural members; fatigue in structural members and rigid frames.

Despite the lack of welding treatment, this will be an interesting reference volume for all those interested in structural design problems.

Stress corrosion

STRESS, CORROSION, CRACKING & EMBRITTLEMENT. Edited by William D. Robertson. Published by John Wiley & Sons, Inc., New York, 1956. Cloth, 6 by 9 in., 202 pages. Price $7.50.

This compact volume is a compilation of papers presented at a symposium arranged by the corrosion division of Electro Chemical Society in Boston, October, 1954. While none of the 14 papers included specifically discuss welding as a contributing cause in stress corrosion cracking, many of the problems discussed are of interest in the welding field.

Those who have encountered difficulty with this type of cracking should read the discussion covering phenomena and mechanism of stress corrosion cracking, structure of grain boundaries, stress corrosion cracking of austenitic stainless steel and mild steel, ductility of steel with various concentrations of hydrogen, and laboratory techniques for investigation of this cracking. Papers reflect significant work being done in university and industry and fairly covers development of the last 12 years in this area.

Molybdenum

JOINING OF MOLYBDENUM. Published by the Office of Technical Services, U.S. Dept. of Commerce, Washington 25, D.C. Part 2—111833, Nov. 1955, is 130 pages. Price $3.25. Part 3—PB 121845, Nov., 1956, is 35 pages. Price $2.25.

Research on welding of molybdenum led to the recommendations for improved welding described in two reports. Part 2 has information on sintered-vacuum and arc-cast molybdenum welds, deoxidation, atmosphere requirements for nitrogen and oxygen, nitrogen and oxygen interactions, heat treatment of welds and butt joints.

Part 3 is directed toward control of ductility by reducing the interstitial elements, oxygen and nitrogen, through control of welding atmosphere, changes in the parent plate, post-weld diffusion treatment and aging of the weld metal.

Plant maintenance

TECHNIQUE OF PLANT MAINTENANCE & ENGINEERING, 1957. Published by Plant Maintenance Show, New York, 1957. Cloth, 8½ in. x 11 in., 273 pages. Price $10.00.

The 31 papers presented at the technical section of the 8th National Plant Maintenance and Engineering Show in Cleveland in January, 1957, have been compiled in a single volume for the benefit of those interested in industrial maintenance problems. Not only are papers included, but also a transcript of the discussion each paper provoked.

While there was only one paper on maintenance welding, welding plays an important role in many of the maintenance subjects discussed.

RW manual

RESISTANCE WELDING MANUAL, 3rd edition, Vol. 1, edited by E. J. Del Vecchio. Published by Resistance Welding Manufacturers' Association, Philadelphia, 1956. Simulated leather, 6 by 9 in., 359 pages. Price $3.

This manual, heretofore published as a single volume, will henceforth be available as a two-volume series. First volume contains 18 chapters and an extensive appendix.

Volume 1 is composed of two sections: first deals with processes and the second covers materials. Both sections have nine chapters. Processes discussed include major resistance welding processes, such as spot welding, projection welding, seam welding, flash and upset butt welding, cross wire welding, electro brazing, electro forging and upsetting.

Second section (materials) covers gamut of materials weldable by the various resistance welding processes. Important part of the appendix is the 47-page bibliography, which, with few exceptions, includes only those articles on resistance welding published in the U. S. since 1945. Articles covered before that date are of basic or continued value and importance. Some articles from British journals are also included.

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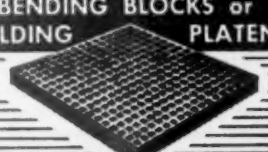

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51. METALWORKER'S CRAYONS—Whittaker, Clark & Daniels, Inc. Literature on metalworker's soapstone crayons, includes price list.

52. REPAIR WELDING—Tempil Corp. 1957 edition of "Recommended practice for repair welding and fabrication welding of steel castings," is 52-page reference manual, first revision since 1951.

53. BRAZING MANUAL—All-State Welding Alloys Co., Inc. 24-page book contains data for brazing shapes, sheet, castings, tubing and assemblies of copper, brass, steel, aluminum and cast iron.

54. ELECTRODES—Harnischfeger Corp. Folder discusses and lists "P&H" heat-treatable electrodes. Includes graph of weld metal tensile strength, heat-treating properties.

55. WELDING CONTROL—General Electric Co. Bulletin GEA-6593, in four pages, tells about non-synchronous resistance welding control for special combination of single or multi-electrode welding machines.

56. STEEL PIPING—Babcock & Wilcox Co. Data folder TDC-138 presents two tables, one with dimensional data, the other ASTM, ASME specifications.

57. WEATHER PROTECTOR—Frommelt Industries. "Car-dox" all weather protector for rail and truck docks has galvanized steel frame; folder 300.

58. HELMET—Fibre-Metal Products Co. New lift-front Fibre helmet illustrated in catalog page, bulletin 47.

59. CUTTING TOOLS—Stupalox Div. Case history of how oxide cutting tools raised production, lowered machining cost and reduced capital investment.

60. FIRE EXTINGUISHER—General Pacific Corp. Water-type fire guard in stainless steel is treated in leaflet; includes specifications.

61. PLATE CLAMP—Portomag, Inc. Electro-magnetic plate clamp reported in illustrated page. Base has over 3,000 lb holding power for positive positioning.

62. BRAZING ALLOYS—Handy & Harman. Firm lists distributors of their low-temperature silver brazing alloys and flux.

63. JACKET GRIPPERS—Tweco Products, Inc. Lapped end steel band applied around rubber jacket of welding cable prevents jacket slippage and strand breakage. Cable cutting hand tool described.

64. ELECTRODE HOLDER—Martin Wells Co. Six new patented features on "Tong-grip" electrode holder, manufacturer claims. Includes wedge cable connector and slip-on lower insulator.

65. CLEANSER—Lightfoot Schultz Co. Model 500 powder soap dispenser is detailed in form 1-300.

66. RADIOACTIVITY—Atomic Instrument Co. Short form catalog edition III gives sneak preview of radioactivity measurement instrumentation.

67. SAFETY EQUIPMENT—General Scientific Equipment Co. Catalog 10 is buyers-guide to safety equipment. Lists general specifications.

68. TITANIUM—Republic Steel Corp. Leaflet explains titanium uses, a new dimension in corrosion resisting metals.

69. BRAZING FURNACES—Surface Combustion Corp. Page treats series "BF" muffle-type brazing furnace developed for brazing and heating wide variety of small parts in protective atmosphere.

70. CONTROL VALVES—Ross Operating Valve Co. Speed control valves are detailed in bulletin 305A. Parts list included.

71. INSPECTION EQUIPMENT—Challenge Machinery Co. Literature treats lightweight magnesium and aluminum inspection equipment. Catalog folder No. 824 lists angle plates, tooling angles and scribers.

72. WELDER—Graham Mfg. Corp. "Insul-pin" welder attaches insulation pins to galvanized duct work. Page describes welder; offers specifications.

73. BLAST CLEANING—Clementina Ltd. 32-page catalog presents blast cleaning equipment. Includes sandblast pots, remote control valves, nozzles, etc.

74. ADAPTER UNIT—Vickers Electric Div. Specification bulletin 7004 on constant potential adapter unit lists performance data, gives application and ordering information.

75. ACETYLENE CYLINDERS—Independent Engineering Co., Inc. Leaflet pictures products engineered and built for compressed gas manufacturers; among them the pre-cooler, argon refiner, gas cylinder tester and gas supply trailers.

76. SPOT WELDER—Ampower Products Co. Portable spot welder model 55, for heavy duty work, is described on page NWSA 750.

77. RESISTANCE WELDING—Mallory & Co., Inc. Electrodes, holders, seam welding wheels, dies and fixtures, castings and forgings—all are handled in bulletin.

78. WELDERS—A. O. Smith. Leaflet pictures line of welders, among them the Model 3000, for d-c welding and 650E for manual or automatic welding.

79. TURNING ROLL—Cayuga Machine and Fabricating Co., Inc. Bulletin 5713 discusses power and idler turning rolls. Includes illustrations and specifications.

80. POWDER BLOWER — Magnaflux Corp. Paper details XB-2A powder blower unit designed for application of powders to large areas, especially vertical or overhead surfaces, and in inspection of large weldments. Sprays powder or clean air.

81. AUTOMATIC WELDING—Hobart Bros. Co. Automatic equipment described includes constant voltage arc welder, tractor-type automatic submerged-arc welder and Model HIG-6D for Mig welding.

82. ELECTRONICS—Robotron Corp. Catalog entitled "Industrial electronics for you," illustrates and discusses some of firm's electronic controls.

83. TRANSFORMER—Kirkhof Mfg. Corp. Resistance welding transformer is detailed in folder. Includes ratings, specifications.

84. STUD WELDING—KSM Products, Inc. Power pack for stud welding and new Mark XI stud welder are treated in two-color page.

85. ARC WELDING—Erico Products, Inc. Bench fixture is detailed in catalog L-150. Features are C-clamps which lock cable into position in welder and quick mold changes for various size cable.

86. TORCHES—Liquid Carbonic Corp. New line of torches—general purpose, medium duty, aircraft, etc.—treated in introductory booklet NWSA 220.

87. ATOMIC ENERGY—Robertshaw-Fulton Controls Co. Page lists components for atomic energy—packless valves, stainless steel bellows, flexible seals, etc.

88. LEAD—National Lead Co. Catalog "Lead for radiation shielding," discusses radioactive isotopes, atomic reactors, radium and X-rays.

89. RESISTANCE WELDERS—Banner Welder Inc. Brochure illustrates press-type spot welders, rocker arm spot welders and spot projection welders, etc.

90. CHEMICALS—Lindsay Chemical Co. Small pamplet gives history and information on company producing cerium, rare earth and thorium chemicals.

91. BLAST CLEANER—Vacu-Blast Co., Inc. "Vacu-Blaster" gun is miniature blast cabinet which directs abrasive and picks up dust, dirt, rust, etc. Booklet includes optional equipment.

92. TIP CLEANERS—Maitlen and Benson, Inc. Illustrated sheet treats cutting and welding tip cleaners; gives sizes, types.

93. GRINDER—Bellows Co. Pencil-size grinder which grinds, deburrs, cuts, polishes, and engraves, is described in bulletin PG-10.

94. TRAINING COURSE—International Correspondence Schools. Literature on course offered in resistance welding technology, developed by Resistance Welder Mfg.'s Association.

95. SET-UP SYSTEM—Universal Vise and Tool Co. Eight page booklet 557 tells of new "Clamp-N-Jack" set-up system for use with boring mills, planers, milling machines, presses and drill presses.

96. CONSTRUCTION MAINTENANCE—Eutectic Welding Alloys Corp. 32-page special issue on construction maintenance (TIS 2832) is devoted to industry's problems in maintenance. Gives weld savings case histories and methods utilized.

97. MACHINERY MOUNT—Robinson Aviation, Inc. Bulletin 2000 on all-metal machinery mount offers illustrations, dimensions and mounting recommendations.

98. WELDING ACCESSORIES—K-G Equipment Co. Change notices (form CN-57) on prices of some of firm's accessories and supplies.

99. STEEL PROGRESS—American Iron and Steel Institute. 72-page booklet titled "Charting steel's progress" presents iron and steel industry statistics in graphic form.

100. WELDING POSITIONERS—Aronson Machine Co. Bulletin HTS57 features eight headstock-tailstock positioners in capacities from 5,000 to 160,000 lb.

101. PROCESS EQUIPMENT—Chicago Steel Tank Co. 32-page color brochure describes operations of custom fabricators of process equipment and pressure vessels.

102. WALL CHART—Stulz-Sickles Co. 28½ in. by 45 in. chart pictures 33 different sizes of "Manganal" 11%-13½% manganese-nickel steel wedge bars.

103. GRINDING WHEELS—Wall Colmonoy Corp. Two-color 8½ by 11 engineering data sheet 5 lists grinding wheel recommendations for finishing overlays of Colmonoy hard-facing alloys.

104. HELMET ATTACHMENT—American Optical Co. Welding helmet attachment to fit all peak-type caps is described in bulletin 43; new way to attach a welding helmet to a safety cap.

105. ELECTRODES—Lincoln Electric Co. Directory of automatic electrodes and fluxes for submerged arc welding and hard-facing.

106. GOGGLES—Dockson Corp. Head and eye equipment fully illustrated and described in booklet 56-06. Price list enclosed.

107. PROTECTIVE CREAM—Ayerst Laboratories. "Derodex," hand cream which protects skin from acid, etc., is minutely described in 15 page illustrated booklet.

108. 450 TON LIFT—Kellogg Co. Booklet explains how industrial lift held 450 ton caisson 152 ft in air for four weeks during construction of offshore radar platform.

109. TITANIUM—Johnston & Funk Titanium Corp. Illustrated article "J & F titanium gives anodizing racks new life," available.

110. GRINDING WHEELS—Cincinnati Milling Products Div. New booklet "Cincinnati centertype grinding wheels," (PG-341) gives features and applications plus table of suggested wheel gradings.

111. CABLES—General Cable Corp. Colorful folder on welding cables and welder power supply cables. Details specific types and gives specifications.

112. BRAZING ALLOYS—Alloy Specialties Co. Catalog covers range of phosphor-copper and phosphor-copper-silver brazing alloys.

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125. Adjustable Clamp Co.—Catalog on complete line of "Jorgensen" and "Pony" clamps.

126. Air Reduction Sales Co.—Details on "Airco" inert-gas welding processes.

127. Air Reduction Sales Co.—Catalog 1318 "Airco Electrode Guide" to help select the right electrode for your specific job.

128. Air Reduction Sales Co.—Complete information and literature is available on low-cost inert-arc welding of mild steel.

129. Air Reduction Sales Co.—Write for further information on the new Airco "Dual Range" flowmeters.

130. Allied Welder Corp.—Information on standard and special welders, automation equipment, automatic arc welders, welding guns and creative design.

131. Alloy Rods Co.—Write for complete details of "Atom-Arc 7016" iron-powder low-hydrogen electrodes.

132. All-State Welding Alloys Co.—Write for new instruction book on 62 alloys and fluxes.

133. Aluminum Co. of America—Write for booklets and films that show how easy it is to weld, braze and solder aluminum.

134. American Manganese Steel Div.—Write for Amsco Bulletin MN-56.

135. American Optical Co.—Write for further information on the "AO 486" flexible mask welding goggles and the "AO 489 Companion" chipper's goggles.

136. Ampco Metal, Inc.—Write for bulletin W-17 for further information on Ampco-Trude 160 spooled wire and other Ampco electrodes.

137. Aronson Machine Co.—Write for detailed information on positioners.

138. Atlas Welding Accessories Co.—Write for further information on the new wood grip weld cleaning tools.

139. Bay State Abrasive Products Co.—Write for further information on reinforced, raised-hub disc grinding wheels.

140. Becker Bros. Carbon Co.—Write for catalog giving complete specifications and scaled drawings of carbon welder brushes.

141. Bernard Welding Equipment Co.—Write for further information on the "Short-stub" electrode holders.

142. Bridgeport Brass Co.—Write for booklet, "Bronze Welding Alloys."

212. The Budd Co.—Write for further information on the Nuclear System's radiography machine "Model 30."

143. Cam-Lok Div.—Write for catalog and prices on complete line of welding accessories and supplies.

144. Cayuga Machine & Fabricating Co.—Write for further information on the Cayuga welding head manipulator and send job specifications for recommendations.

145. Chicago Hardware Foundry Co.—Write for further information on "Fuse-Well" cast-iron welding rods and electrodes.

146. Columbia Electric Mfg. Co.—Write for 8-page catalog WE-400 for line of testing equipment.

147. Contour Marker Corp.—Details on establishing and marking a point at any angle.

148. Crucible Steel Co. of America—Information on how "Rexweld" helps to increase production, lower downtime, and cut manufacturing and maintenance costs.

149. Cullen-Friestedt Co.—Write for the new "C-F Positioner Catalog" on low-cost welding.

150. Delta Welder Corp.—Details on how equipment developments and machines can save you time and money in high-production resistance welding.

151. Dockson Corp.—Write for complete catalog on Dockson regulators.

152. Drawalloy Corp.—Write for bulletin 355-DC for complete information on every grade of Drawalloy wire.

153. Eastman Kodak Co.—Write for information on how the "Type AA" X-ray film can improve your radiographic operation and help you get more out of present X-ray or gamma-ray equipment.

154. Eisler Engineering Co.—Write for Catalog No. 93-57 for complete line of spot and wire butt welders.

155. Erico Products, Inc.—Write for a Cadweld demonstration in your plant.

156. Eutectic Welding Alloys Corp.—Send for the new 1958, 180-page pocket-size "Welding Data Book."

157. Fibre-Metal Products Co.—Write for catalog 24 and bulletin 39, cataloguing the best in working protection.

158. Foote Mineral Co.—Informative brochure, "Raw Materials for Welding Rod Coatings."

159. General Cable Corp.—Details on how aluminum welding cable makes your job easier.

160. General Electric Co.—Write for bulletins GEA-6408 (Standardline) and GEA-6593 (Customline) for further information on resistance welding controls.

161. H & M Pipe Beveling Machine Co.—Write for illustrated bulletin on model "O" cutting and beveling machine.

162. Handy & Harman—Write for booklet detailing values, techniques and economies of low-temperature silver brazing.

163. Harnischfeger Corp.—Write for bulletin R-29 to help you select the exact type of P&H iron-powder low-hydrogen electrode you need for high-speed, all-position welding at low cost.

164. Harnischfeger Corp.—Write for further information on P&H welding positioners.

166. Haynes Stellite Div.—Write for literature on Haynes hardfacing alloys.

167. Hobart Bros. Co.—Write for further information and prices on Hobart arc welding equipment.

168. Independent Engineering Co., Inc.—Details on how to reduce cylinder handling with gas supply trailers.

169. International Nickel Co., Inc.—Send for new folder, "Inco-Rod 'A' Electrode", which lists test data on 23 combinations of dissimilar alloys joined with this electrode.

170. International Nickel Co., Inc.—Write for a complete list of Inco welding products including specification data and recommended uses.
1610—Welding Eng—9-18—alts—Pflieger

171. Jackson Products—Write for further information on new "Life Guard" safety cap, on "Supergoggles" and on the "Frigicap."

172. Krembs & Co.—Write for chart and sample of any of 25 "Flumines."

173. Lenco, Inc.—Write for further information on the "Hi-Amp" aluminum electrode holder.

174. Lincoln Electric Co.—Write for bulletin SB-1350 containing construction details and specifications and bulletin SB-1343 telling what it will do for you.

175. Linde Co.—Write for further details about "Unionarc" welding.

176. Linde Co.—Write for booklet F-1107 showing the "Oxweld W-47" welding torch and get details for a demonstration in your shop.

177. Linde Co.—Write for booklet on the "X-7" anti-spatter compound.

178. Liquid Carbonic Corp.—Write for illustrated literature on "Liquidweld" gas welding and cutting equipment.

179. Magnaflux Corp.—Write for further information on how Magnaflux test systems can help your company sell welding more profitably to a bigger market.

180. P. R. Mallory & Co.—Write for your copy of the Mallory catalog of standard resistance welding electrodes.

181. Merrill Brothers—Information on lifting clamps, twin and drum lifters, drum tilters and other material-handling devices.

182. Miller Electric Mfg. Co., Inc.—Write for further information on new Miller "Gold Star" a-c/d-c welder.

183. National Carbide Co.—Write for name and address of nearest supplier.

WELDING INFO-AIDS

USE THIS CARD for Literature, Catalogs, and Bulletins shown on preceding pages and for those featured in this month's ads as listed opposite and on following page

Also information about

NEW PRODUCTS described on pages 88 to 100

Every month WELDING ENGINEER lists many new catalogs and bulletins available from manufacturers. All are yours for the asking. However, this service is valuable to you only if you use it.

USE POSTPAID CARD →

★ For copies of any manufacturers' bulletins described on these pages, circle the number of the items on card at right. Fill in your name, title, company and address. This has to be done only once on either post card. You need no postage.

★ For additional information on New Products described in this issue, circle the numbers and the items that interest you. The New Products section begins on page 88.

WARNING!

Illegible or incomplete addresses may keep you from receiving the information you desire. And remember, cards postmarked after the deadline date cannot be processed.

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Welding Info-Aids,
Welding Engineer
P.O. Box 28
Morton Grove, Ill.

Literature offered in ads

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184. National Welding Equipment Co.—Write for 44-page illustrated brochure on regulators.

185. Nelson Stud Welding—For further information on the Nelson "NS-10" stud welder, write for a descriptive folder.

186. Nickelson Tool & Die Co., Inc.—Descriptive folder on "Woerner" tubular profile cutter.

187. Norton Co.—Write for booklet No. 1748 for further facts about reinforced abrasive products.

188. Page Steel & Wire Div.—Send for folder DH-402A, "Submerged-Arc and Inert-Gas Welding Wire", and booklet DH-1277, "Gas Welding Rods."

189. Pure Carbonic Co.—Write for information concerning CO_2, the low-cost gas shield for inert-arc welding.

190. Renfroe & Sons, Inc., J. C.—Write for catalog of complete line of steel lifting clamps.

191. Sellstrom Mfg. Co.—Write for Sellstrom bulletin 33-C for further information on the "619" and "621" jumbo chipping goggles.

192. Shawinigan Products Corp.—Write for name and address of nearest dealer.

193. Shoot-A-Lite Corp.—Literature on safety gas lighter for welding and cutting torches.

194. Smith Welding Equipment Corp.—Write for further information on the new air-acetylene torch.

195. Steel Sales Corp.—Write for further information on the new "Deoxo" silver brazing flux.

196. Stoody Co.—Write for the "Stoody Guidebook" and folder covering semi-automatic procedures for successfully maintaining all your wearing equipment.

197. Stulz-Sickles Co.—Write for electrode bulletin and name of nearest distributor.

198. Superior Air Products Co.—Write for catalog on liquid oxygen.

199. Taylor-Winfield Corp.—Data on increasing production and lowering fabrication costs with resistance and arc welding machines.

200. Tec Torch Co., Inc.—Information on "Visuweld" torches for Tig welding.

201. Tempil Corp.—Information on, and sample pellets of, temperature indicators.

202. Tennessee Fabricating Co.—32-page catalog lists "Everything for the Ornamental Iron Shop."

203. Thermacote Co.—Write for name and address of your nearest distributor.

204. Titanium Alloy Mfg. Div.—Send for detailed literature on advantage of "Ruflux" electrode coatings.

205. Tweco Products, Inc.—Write for further information on Tweco's laminated glass cloth insulation with melamine resin.

206. United States Steel Corp.—Write for complete information about the application and fabrication of USS T-1 steel.

207. United Wire & Supply Corp.—Data on Phoson brazing, Phoson and Sil-Bond with Sil-Flux alloys.

208. Vickers Electric Div.—Write for complete information on "Controlarc" and other high-quality high-performance welding machines under development.

209. Victor Equipment Co.—Write for descriptive bulletins on two and three-hose machine cutting torches.

210. Victor Equipment Co.—Write for a copy of the "Victor Hardfacing Manual" showing you the right rod to use and how to apply it.

211. Worthington Corp.—Write for helpful information on positioners, automatic welding head manipulators, turning rolls and head and tailstocks.

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Welding Info-Aids,

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this is Super-Mel®

TWECO'S laminated glass cloth insulation with melamine resin

IT WILL NOT BREAK
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Tip insulators on your electrode holders take an awful beating. Searing arc heat causes most materials to carbonize quickly and conduct current, destroying their insulating value. Slam-bang handling and dropping soon cracks and shatters brittle insulation. Only SUPER-MEL has proved its ability to stand up in tough arc welding service. This fireproof insulation is built up of many layers of strong, woven glass cloth, laminated and bonded together under great pressure with pure melamine resin. It will never char or carbonize. It will remain sound for month after month, in spite of hard service and abuse. Standardize on SUPER-MEL . . . exclusively yours on TWECOTONG electrode holders.

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MANUFACTURERS: ARC WELDING ELECTRODE HOLDERS, GROUND CLAMPS, CABLE CONNECTORS, TWECO-LITE ALUMINUM WELDING CABLE

PRODUCTS, INC.

P. O. BOX 666 • Factory: Boston at Mosley • Phone AMherst 5-1684 • Wichita 1, Kansas

No special equipment... No special training needed

Joining problem on sub-zero oil eliminator solved with Inco-Rod "A" electrode. Above shows 36-pound end head and 113-pound slip-on flange (both extra-heavy mild steel) which were welded to a 12-inch stainless steel pipe. Unit designed to work at minus 50° F. and 500 psi.

Welds dissimilar alloys for sub-zero service with versatile Inco-Rod "A"

This weldor is completing the fabrication of an oil eliminator used to remove oil from a liquefied petroleum gas stream. Working temperatures in the unit: minus 50° F. Working pressures: 500 psi.

The end cap and slip-on flange are mild steel (A 350 Grade C). The outer casing is stainless steel (type 304).

In preparing the job for welding, joints were tack-welded. All – save one – were given a 30-degree bevel to permit a 60-degree V-groove weld. The exception, a slip-on flange joint, was butt-welded.

Produces high strength welds

The first pass was made with Inco Rod "A"* 1/8-inch electrodes. Thereafter, 5/32-inch rods with a short arc . . . 90-100 amperes DC reverse polarity . . . were used. Stress relief followed. Welds have high strength and are capable of withstanding sub-zero temperatures and 500 psi pressures.

What's your joining problem?

Forged steel to high alloys? Stainless to carbon steel? Whatever it is you'll get strong, ductile welds . . . corrosion resisting . . . of X-ray quality with Inco Rod "A" electrode. What's more, welds have excellent properties at both sub-zero and elevated temperatures.

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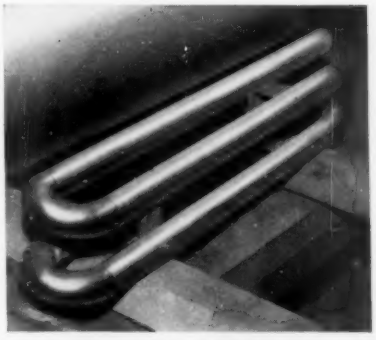
A new Inco folder "Inco-Rod 'A' Electrode" list test data on 23 combinations of dissimilar alloys which can be joined with Inco-Rod "A". Send for your copy today.



Interior *is made by joining 1½" tubing (304 Stainless Steel) and 180° U-bends (mild steel)* Fabricator: Sparling Tank Ltd., New Toronto, Canada.

The International Nickel Company, Inc.
67 Wall Street New York 5, N. Y.
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